College ABCD

Test 1

Assessment Period:	**2022 S2**
Course:	**ESSENTIAL MATHEMATICS**
Unit:	**Unit 2: Essential Mathematics (1.0)**
Accreditation:	**A**
Weight:	**25%**
Maximum Mark:	**90**
Due Date:	**16 Aug**

Assessment Conditions

Permitted Materials: Pen, pencil, ruler, eraser, sharpener, calculator

Materials NOT permitted: iPods, mobile phones, electronic devices (except scientific calculator), "smart" watches, laptops or CAS enabled calculators

Student Examination Policy

- Attend the test for the full duration.
- Do not be involved in unfair or dishonest practice.
- Refrain from talking to, otherwise communicating with or disturbing other candidates.
- Raise a hand and wait for the teacher's assistance if required.
- Materials cannot be borrowed from another candidate during the test.
- Examination procedures apply until you leave the room.
- Pastoral and academic consequences will arise of these procedures are not met.

Student Feedback
Verbal and/or written feedback will be given within two weeks of submission.

Additional Information

- Use **black or blue** ball-point pen.
- Pencil is to be used for diagrams/sketches/graphs.
- Write your name and the teacher's name at the top of each page.
- Record answers on the test paper.
- Answer all questions and ensure that your answers to parts of questions are clearly labelled.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Answers should be given in exact form unless otherwise stated.
- Fractions should be simplified where appropriate.

Other Applicable Policies

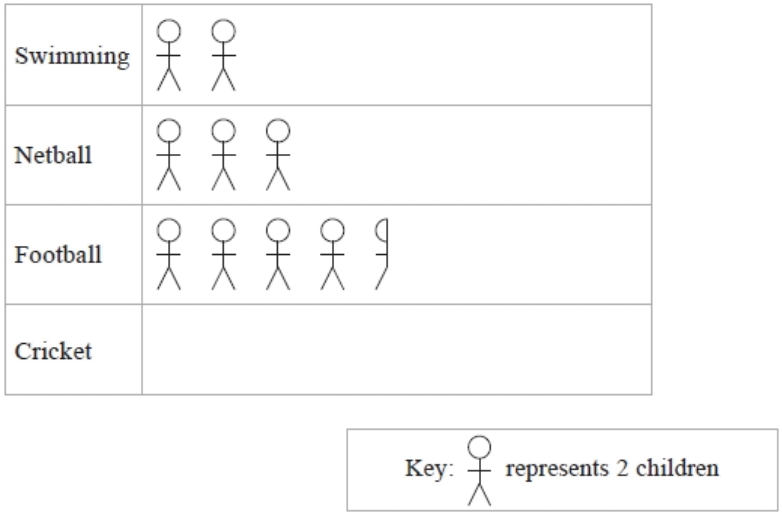
BSSS and School policies on academic integrity, as noted on the unit outline, apply.

For academic integrity
Review BSSS Policy and Procedure Manual 4.3.12 for more details.

Question 1 (1 mark, 1 mark)

Jordan asks all the children in their class to nominate the sport they like best.

The pictogram shows how many children like swimming best, like netball best and like football best.



D level question CT1

applies simple mathematical concepts in limited contexts to routine problems

8 children like cricket best.

a) Use this information to complete the pictogram.

b) Work out the total number of children in Jordan's class.

Question 2 (1 mark, 1 mark, 1 mark, 1 mark, 1 mark, 1 mark, 1 mark, 3 marks)

Blake counts the number of cars parked in their street at **8 am on each of 10 days**.

5 3 3 2 0 2 4 2 4 15

a) Determine the mode.

b) Calculate the mean showing your working out.

c) Find the median showing your working out.

D Level RC1

represents simple mathematical concepts in numerical or graphical form in routine problems for routine contexts

Blake then counts the number of cars parked in their street at **5 pm on each of 20 days.**

They records the information in a frequency table.

Number of Cars	Frequency
0	3
1	1
2	3
3	4
4	7
5	2

d) Determine modal number of cars parked in their street at 5 pm?

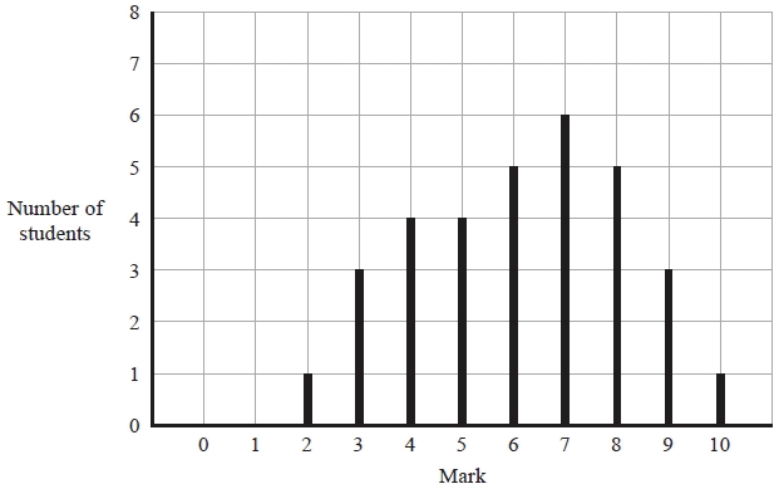
e) Find the total number of cars Blake records in the frequency table for 5pm data.

f) Calculate the mean number of cars Blake observed parked on their street at 5pm per day.

g) Calculate the median number of cars Blake observed parked on their street at 5pm per day.

h) On the grid paper below, create a neat and professional frequency histogram that displays the number of cars parked on Blake's street at 5pm for the 20 days.

Question 3 (1 mark, 1 mark, 1 mark, 1 mark, 1 mark)
The graph shows information about the test marks of Mr Bernardo's history class.



a) Calculate the number of students who did the test.

b) Determine the modal score on the test.

c) Calculate the range of the test marks.

d) Do there appear to be any outliers in this data set? Explain your answer.

e) How would you best describe the spread of marks on this test?

C level questions CT2

applies simple mathematical techniques to solve routine problems in some contexts

Question 4 (1 mark, 1 mark, 1 mark)
The stem and leaf diagram below shows the length, in cm, of some offcuts of timber.

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

Key

2 | 3 represents 23 cm

a) Determine the length of the longest offcut of timber?

b) Find median length of the offcuts of timber?

c) Calculate the range of lengths for the offcuts of timber?

D level question CT2

applies simple mathematical techniques to solve routine problems in limited contexts

Question 5 (4 marks)

Four numbers have a range of 15, a median of 20 and a mode of 23. Write the four numbers of this data set below.

A level question CT1

applies mathematical concepts in a variety of complex contexts to routine and non-routine problems

Question 6 (2 marks, 1 mark, 1 mark, 2 marks, 2 marks)

Consider the following number of notifications Aga and 8 of their friends received on their phones over the weekend while visiting Aga's Cousin Salima in Goulburn:

37, 46, 35, 56, 56, 35, 125, 36, 48, 56

The median for this data set is 47 and the mean is 53.

a) This data set has an outlier. Which score is it? Explain how you know it is an outlier.

b) Remove the outlier from this data set then find the median.

c) Remove the outlier from this data set then find the mean.

d) Which measure (median or mean) was most impacted by the outlier? Explain why this measure had the greatest impact.

e) If dear old Cousin Salima were to write a post on Facebook complaining about the number of times their favourite cousin's friendship group received notifications on their phones which number would Cousin Salima use to report if they wanted sympathy from their Facebook Friends? Explain your answer.

C level question CT2/RC2

applies simple mathematical techniques to solve routine problems in some contexts

communicates mathematical judgements in oral, written and/or multimodal

Question 7 (3 marks)

Ying and Callagun were studying for a maths test, Ying worked out the quartiles as follows:

23, 59, 68, 84, 95, 104, 127, 130, 151

$$\text{Median} = \frac{95+104}{2} = 99.5$$

$$Q_1 = 68$$

$$Q_3 = \frac{127+130}{2} = 128.5$$

Callagun thought something looked not quite right with Ying's work but could not quite work out where their friend went wrong. Have a look at what is written, find the mistake Ying made and explain how you would fix their mistake.

B level question RC1

represents mathematical concepts in numerical and graphical form in routine and non-routine problems for a variety of contexts forms, using appropriate language

Question 8 (2 marks)

In a competition, a contestant must complete 12 challenges earning as many points as possible. Kiran's scores for the first 11 challenges are:

32, 38, 45, 55, 66, 86, 94, 98, 106, 108, 117

Determine their score in the final round if the Lower Quartile (Q_1) value is 47.5. Show your working out.

A level question CT2

select and applies mathematical techniques to solve routine and non-routine problems in a variety of complex contexts

Question 9 (1 mark, 2 marks)

Alex measured the Heart Rate of 15 people and recorded the values to the left, then asked the 15 people to walk up some stairs.
Alex measured their heart rates again and recorded the data to the right.

The results are shown in a back-to-back stem and leaf diagram.

Before		After
9 8	5	
7 6 6 4 1 0	6	5 8 8 9
9 8 6 3 2	7	2 4 7 8
4 1	8	5 6 8
	9	1 3 7
	10	2

Key for before
8 | 5 means 58
beats per minute

Key for after
6 | 5 means 65
beats per minute

a) Describe how values have changed.

b) What can you conclude about walking up the stairs from these measures?

C level question RC1

represents mathematical concepts in numerical and graphical form to some routine and non-routine problems for routine contexts

Question 10 (1 mark, 1 mark, 1 mark, 2 marks, 3 marks—1/2 mark per option))

In science class, Professor Ali's students were counting the number of tardigrades (a tardigrade is a microscopic water-dwelling animal) in each water specimen they collected at the Lake. The results from each student's collections were as follows:

3 9 11 12 12 13 15 15 17 17 19 22 22 24 29 32 33 36 38 38

a) Find the value of the sixth decile from the number of tardigrades listed above.

b) What percentage of the scores fall below 16 tardigrades?

c) Find the 10th percentile.

d) Find the first quartile.

C level questions across CT1/RC1

applies mathematical concepts in some contexts to routine and non-routine problems

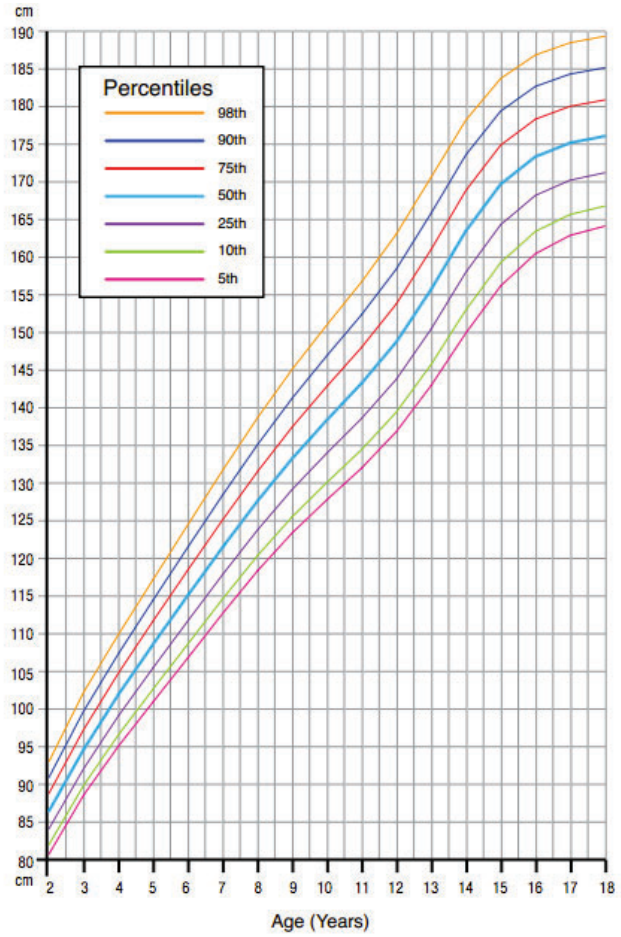
represents mathematical concepts in numerical and graphical form to some routine and non-routine problems for routine contexts

e) Decile 5 is the same as which of the following? Circle all correct answers that apply.

the third quartile	the first quartile	the 75th percentile
the 25th percentile	the median	the 50th percentile

Question 11 (1 mark, 1 mark, 1 mark)

The chart below shows the range of heights for Boys aged 2 to 18.



D level question RC1

represents simple mathematical concepts in numerical or graphical form in routine problems for routine contexts

a) Kayden is 14 years old and 169cm, what percentage of boys are taller than Kayden?

b) What is the median height for boys aged 7?

c) If Harrison is 160cm tall at 16 years old, what percentage of boys are shorter than Harrison?

Question 12 (3 marks)

The mean income per person in Australia is $51 390 and it is the same for Germany. However, the standard deviation of income for Australia is $ 11 750 and the standard deviation on income for Germany is $8 280. Explain the meaning of this for the average Australian compared to the average German?

B level question RC2

communicates mathematical information in oral, written and/or multimodal forms, which are clear, using accurate and appropriate language

Question 13 (3 marks, 1 mark, 1 mark)

Cameron works at JB-HIFI and had their daily number of sales recorded per shift. The data was then displayed in the Box Plot below.

The five number summary for the data is as follows:

Lowest Score= 2

Q_1 value = 15

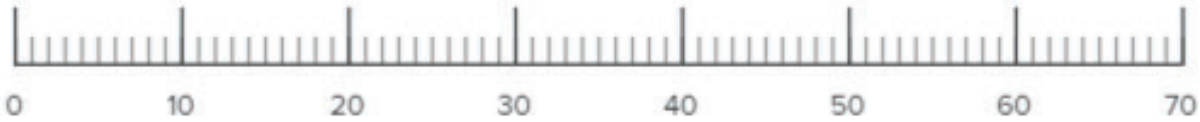
Median = 30

Q_3 value = 42

Highest Score = 50

C level question RC1

represents mathematical concepts in numerical and graphical form to some routine and non-routine problems for routine contexts



Title:

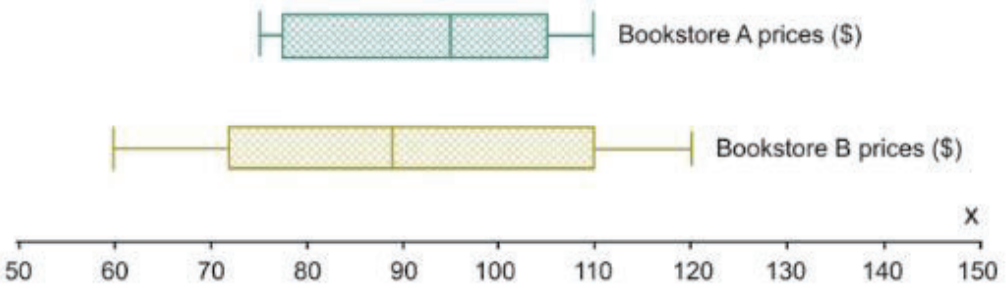
a) Draw the Box Plot that represents this data using the scale provided. Your drawing should be neat and drawn with a ruler. Ensure you provide a title that is suitable for this data.

b) Find the range of sales Cameron made in one shift?

c) Calculate the range of the middle 50% of sales Cameron makes in one shift?

Question 14 (2 marks, 1 mark, 2 marks, 1 mark)

Two bookstores recorded the selling prices of all their books. The results are presented in the parallel box plots below.



a) Which bookstore had more consistent prices? Explain how you know this.

b) What is the difference between the most expensive book in Bookstore A and the most expensive book in Bookstore B?

c) Is the following statement true or false? Justify your answer with reference to the diagram above.

25% of the books in Bookstore B are as expensive or more expensive than the most expensive book in Bookstore A.

d) What is the Interquartile Range of prices for Bookstore A?

B level questions CT1/RC2

applies mathematical concepts in a variety of contexts to routine and non-routine problems

communicates mathematical information in oral, written and/or multimodal forms, which are clear, using accurate and appropriate language

Question 15 (3 marks, 1 mark, 3 marks, 4 marks)

The number of words per sentence in an article from Better Homes and Gardens magazine were as follows:

10 28 36 27 31 17 14 25 23 27 15 22 18 15 11 21 26 24 24 27 20 19 17 29

The number of words per sentence in an article from the Canberra Times newspaper were as follows:

27 39 38 41 33 34 27 33 28 17 22 27 32 41 18 46 33 27 35 41 12 42 18 32

a) For the ordered Stem and Leaf Plot below, there are some values missing, find the number missing for each.

Better Homes and Gardens words/sentence	Stem	Canberra Times words/sentence
9 8 7 7 5 5 4 1 0	**1**	2 7 8 8
9 8 7 7 7 6 5 A B 3 2 1 0	**2**	2 7 7 C D 8
6 1	**3**	E F 3 3 3 4 5 8 9
	4	1 1 1 2 6

A=_____

B= _____

C= _____

D= _____

E = _____

F= _____

b) Describe the shape of the date for each article.

c) Complete this table finding the unknown values for the Canberra Times Article:

Words per sentence in an article		
	Better Homes and Gardens Article	**Canberra Times Article**
Mean	21.9	
Median	22.5	
Range	26	

d) Write a summary outlining the differences in "Words per sentence" for the Better Homes and Garden article and the Canberra Times Article. The expectation is that you will write at least 4 sentences and comment on the article that you think would be harder to read.

B level questions CT1/RC1

applies mathematical concepts in a variety of contexts to routine and non-routine problems

represents mathematical concepts in numerical and graphical form in routine and non-routine problems for a variety of contexts

Question 16 (8 marks)

Australia and some of its neighbours had their Sustainability Index and Population per squared km recorded. Jacinta and Divalu recorded most of the results.

The countries included in the study were: Australia, New Zealand, Papua New Guinea, Indonesia, Vanuatu, Fiji, Brunei, Malaysia, Philippines, Thailand, Vietnam, Singapore, Cambodia, and Laos.

	Sustainability Index	Population per squared km
Lowest Score	A	3
Q1	44	B
Median	65	88
Q3	C	139
Highest Score	79	8634
Range	71	D
Interquartile range	29	113

Find each of the deleted values showing all your work below neatly and labelled for which value you are finding.

A level questions CT2

select and applies mathematical techniques to solve routine and non-routine problems in a variety of complex contexts

Cross Curriculum priorities:

- Sustainability
- Asia and Australia's Engagement with Asia

Question 17 (3 Marks)

Rodger, Susan and Tiana each have some money.

Rodger has $65
Susan has $100
Tiana has three $5 notes, one $20 note and some $10 notes.

The mean amount of money per person is $80

How many $10 notes does Tiana have? Show all your working our below.

A level question CT2

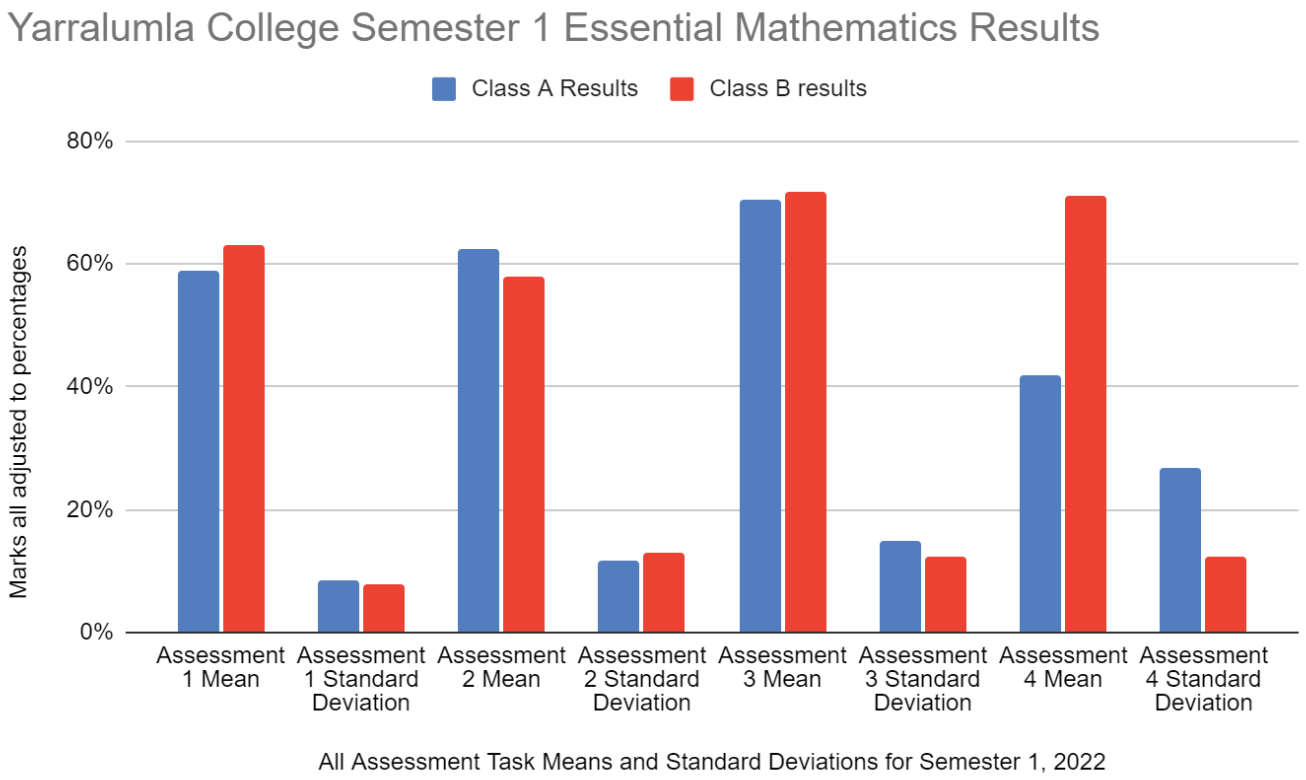
select and applies mathematical techniques to solve routine and non-routine problems in a variety of complex contexts

Question 18 (3 Marks)

Students at Yarralumla College sat their 4th assessment on Tuesday during Line 2. Students at the west end of the school were disrupted by a tiger (escaped from the local zoo) chasing their principal in the car park. Class A's windows are right near the carpark, and they were disrupted by the screams of the principal. Class B is located upstairs in the east end of the building and had no idea what was going on.

(**Note there were no principals or tigers harmed in the creation of this question)

The results for all four assessments across the semester are shown in the graph below.



Write at least 2 sentences that propose a statistical method for addressing the disadvantage experienced by Class A in Assessment task 4.

A level question RC4/RC2

evaluates the potential of Mathematics to generate knowledge in the public good

communicates mathematical information in oral, written and/or multimodal forms, which are well reasoned, using accurate and appropriate language

Highest Possible Response	A Level Q	B Level Q	C Level Q	D Level Q
Q1 (2 marks)				
Q 2 (10 marks)				
Q3 (5 marks)				
Q4 (3 marks)				
Q5 (4 marks)				
Q6 (8 marks)				
Q7 (3 marks)				
Q8 (2 marks)				
Q9 (3 marks)				
Q10 (8 marks)				
Q11 (3 marks)				
Q12 (3 marks)				
Q13 (5 marks)				
Q14 (6 marks)				
Q15 (11 marks)				
Q16 (8 marks)				
Q17 (3 marks)				
Q18 (3 marks)				
Total marks for each grade area	/20 marks	/23 marks	/29 marks	/18 marks
Final Mark for assessment (/90)		Final Grade for Assessment:		

A Level Q	20 marks	22%	Q 5, 8, 16, 7, 18
B level Q	23 marks	26%	Q 7, 12 14, 15,
C Level Q	29 marks	32%	Q 3, 6, 9, 10, 13
D level Q	18 marks	20%	Q1, 2, 4, 11,
	90 marks	100%	

11 ESSENTIAL MATHS TEST: ANALYSIS OF THE TASK USING THE BSSS QUALITY ASSESSMENT GUIDELINE

Outstanding — Coverage of BSSS Accredited Courses	Outstanding — Reliability
High — Bias Awareness	Outstanding — Levels of Thinking
Satisfactory — Student Engagement	High — Academic Integrity

1. COVERAGE OF BSSS ACCREDITED COURSES

Outstanding Coverage of BSSS Accredited Courses – Assessment tasks are strategically planned for alignment with Achievement Standards, unit goals and content descriptors. Assessments are not too big: assessing irrelevant content or criteria; nor too small: missing important content or criteria

COMMENTS

All content descriptors under the statistical analysis unit are covered in this assessment. It also hit on the cross curricular priorities of Sustainability and Asia and Australia's Engagement with Asia as well as the Achievement Standard for using mathematics for the greater good.

2. RELIABILITY

Outstanding Reliability - Assessment tasks and marking are strategically designed to remove all sources of non-relevant variation in measurements.

COMMENTS

The marking scheme for this task is very clear and details how marks were allocated for each question. The marking of the task required the same teachers to mark the same pages of the assessment to ensure continuity and reliability.

3. BIAS AWARENESS

High Bias Awareness - The suite of assessment tasks is designed that promote the diverse needs of gender, socio-economic status, disabilities and/or cultures, and that do not marginalise or favour a student or group of students, or advantage or disadvantage certain background knowledge or ways of thinking.

COMMENTS

All references to gender have been removed and mostly gender neutral names used throughout the assessment Students were required to have prior knowledge in the statistical analysis unit of work only to complete this task.

4. LEVELS OF THINKING

Outstanding Levels of Thinking – Comprehensive assessment tasks are designed that allow students to engage at progressively higher cognitive demands. The suite of assessments demonstrates that there are high expectations for all learners at all levels of learning and opportunities for extending all learners are strategically planned for. Assessment tasks are flexible and varied, promoting a range of assessment modes.

COMMENTS

The levels of thinking required throughout this exam were quite varied and of a higher order for the A level questions. Students were required to apply their knowledge, skills and understanding in unfamiliar contexts and then justify their understanding.

5. STUDENT ENGAGEMENT

Satisfactory Student Engagement – Assessment tasks are appropriately planned to engage students. Assessment tasks are explicitly connected to contemporary issues or student lived experiences, interests, or prior knowledge. The suite of assessment tasks supports student ownership.

COMMENTS

Students were engaged in a wide variety of tasks available to them in the test.

6. ACADEMIC INTEGRITY

High Academic Integrity -Academic Integrity is discussed with students with expectations with respect to academic integrity and the consequences of cheating or plagiarising made clear. Assessment is designed to encourage original thinking from students and require individualised responses that will be different.

COMMENTS

This is an exam under test conditions. The summative nature of the test allows for preparation. However, with non-routine problems in the A and B grade questions, both requires students to

provide answer that have not been pre-learned. Student requirement to provide justification for their reasoning also contributed to a high level of academic integrity.