



# Tutorial Letter 201/1/2018

## Statistics Education in Intermediate and Senior Mathematics

### MAE202N

### Semester 1

### Department of Mathematics Education

This tutorial letter contains feedback of assignment no. 2.

BARCODE



Define tomorrow.

UNISA |   
university  
of south africa

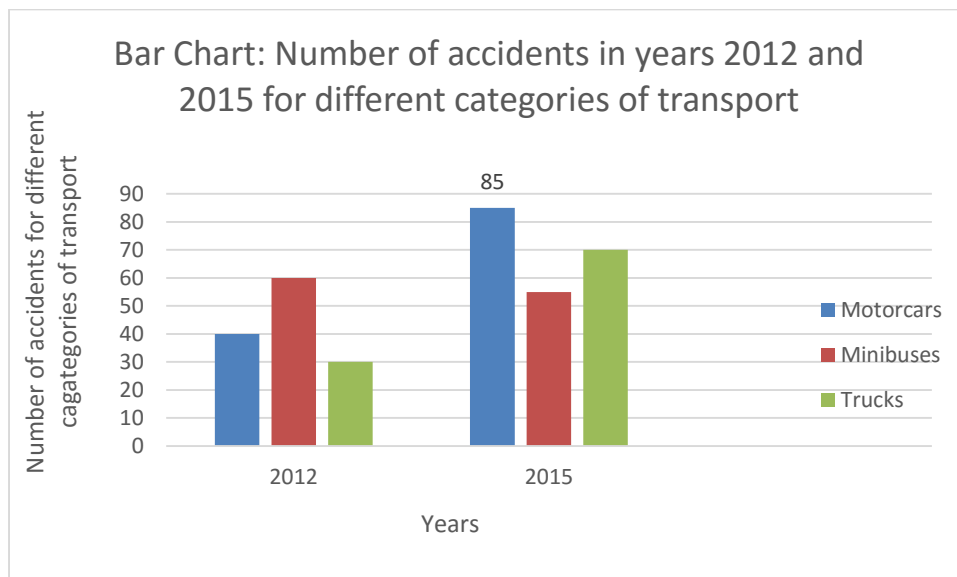
**This tutorial letter contains feedback of assignment no. 2,  
Unique number: 868171**

**Question 1**

1.1 The hat model, a computer random-number generator and a table of random numbers. (3)

1.2

1.2.1



1.2.2 Minibuses had a decrease in accidents. Minibus accident decreased by five accidents in 2015, whereas other accidents had increased. (3)

[11]

**Question 2**

| Marking rubric         |                         | Poor<br>(0) | Good<br>(1.5) | Very good<br>(2) |
|------------------------|-------------------------|-------------|---------------|------------------|
| Defining mean and mode |                         |             |               |                  |
| Planning               | Plan the "before" phase |             |               |                  |
|                        | Plan the "during" phase |             |               |                  |
|                        | Plan the "after" phase  |             |               |                  |
| Evaluation/conclusion  |                         |             |               |                  |

[10]

**Question 3**

3.1

3.1.1 The mean (correct to three decimal places) (2)

$$\begin{aligned}
 \text{Sample mean} = \bar{x} &= \frac{\text{sum of all the observations}}{\text{Number of observations}} = \frac{\sum x_i}{n} \\
 &= \\
 &= \frac{120+170+145+155+170+\dots\dots\dots+125+135+145+180}{35} \\
 &= 144.943
 \end{aligned}$$

### 3.1.2 The median (2)

The median is the middle number of an ordered set of data.

- Start by ordering the data in either ascending or descending order, then the middle data value is the median.

The median = 145

### 3.2 The median because it is not affected by an outlier. (2)

### 3.3

$$3.3.1 \text{ Variance } (S^2) = \frac{\text{Sum of squared deviations}}{\text{sample size}-1} = \frac{\sum(x_i - \bar{x})^2}{(n-1)}$$

$$= 326.820 \quad (3)$$

| <b>Notes: To calculate sample variance</b>                  |                          |
|---|--------------------------|
| 1. Calculate the sample mean                                | $\bar{x}$                |
| 2. Calculate the deviation of each data value from the mean | $(x_i - \bar{x})$        |
| 3. Square these deviations                                  | $(x_i - \bar{x})^2$      |
| 4. Sum these squared deviations                             | $\sum (x_i - \bar{x})^2$ |
| 5. Lastly, average the squared deviations by dividing by    | $(n - 1)$                |

### 3.3.2 Standard deviation

A standard deviation is found by taking the square root of the variance. Thus you take a square root of the variance you found in 3.3.1.

$$\text{Standard deviation} = \sqrt{\text{variance}}$$

$$S = \sqrt{S^2} = \sqrt{326.820168} = 18.078 \quad (2)$$

### 3.3.3

**The interquartile range (IQR)** is the difference between the lower quartile and upper quartile, the formula given by

$$\text{Interquartile range (IQR)} = \text{Upper quartile (Q3)} - \text{Lower quartile (Q1)}$$

However, firstly you need to compute the upper quartile and lower quartile to substitute in the formula.

To determine the upper quartile:

Use the median to divide the ordered data set into two halves.

- Since there are an odd number of data points in the original ordered data set, **do not include** the median in either half.
- The upper quartile value is the median of the upper half of the data.

Therefore, the upper quartile = 156. (2)

To determine the lower quartile:

Use the median to divide the ordered data set into two halves.

- Since there are an odd number of data points in the original ordered data set, **do not include** the median in either half.
- The lower quartile value is the median of the lower half of the data.

Therefore, the lower quartile = 130. (2)

Then substituting in the formula:

The interquartile range = Upper quartile (Q3) – Lower quartile (Q1) (2)

$$= 156 - 130$$

$$= 26 \quad (1)$$

3.3.4 The semi-interquartile range =  $\frac{\text{Upper quartile} - \text{Lower quartile}}{2}$

$$= \frac{26}{2}$$

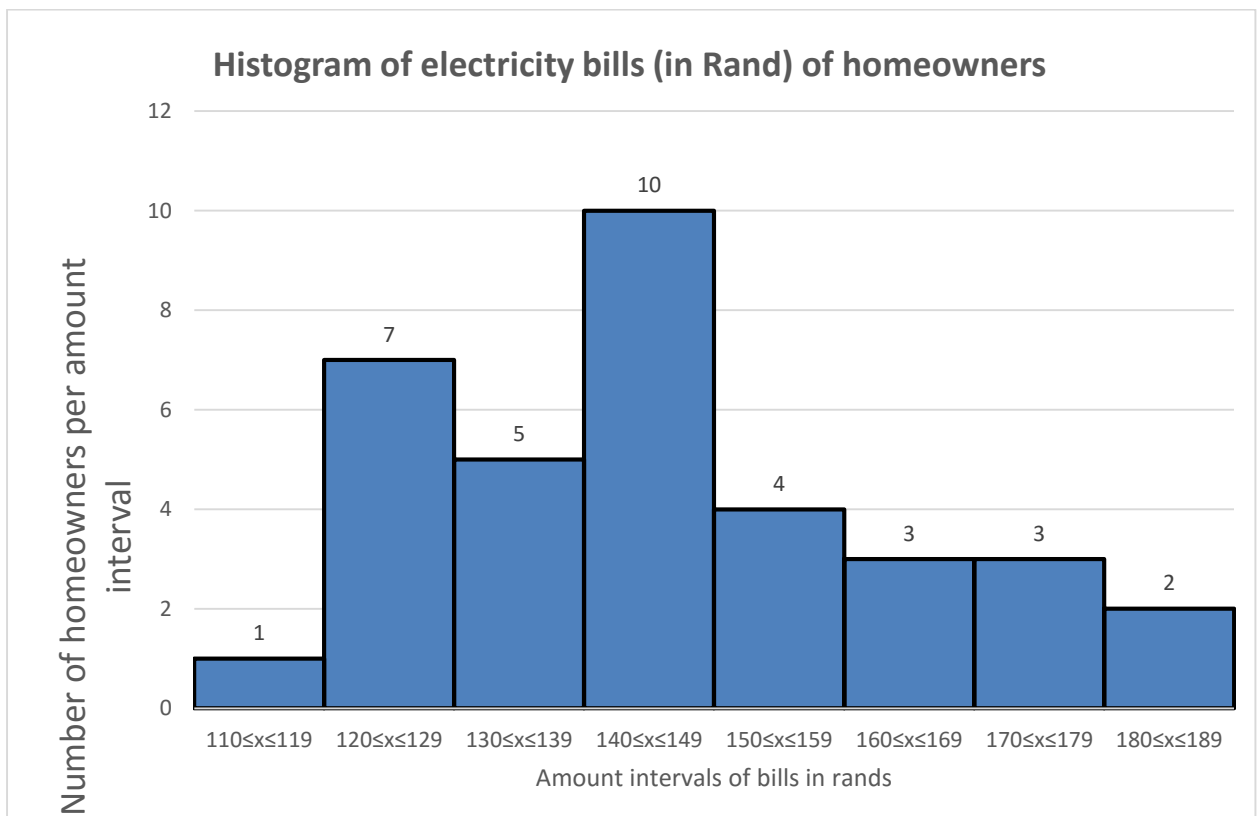
$$= 13 \quad (2)$$

3.4 The interquartile range, because it not affected by outliers. (2)

3.5

| Intervals             | Frequency |
|-----------------------|-----------|
| $110 \leq x \leq 119$ | 1         |
| $120 \leq x \leq 129$ | 7         |
| $130 \leq x \leq 139$ | 5         |
| $140 \leq x \leq 149$ | 10        |
| $150 \leq x \leq 159$ | 4         |
| $160 \leq x \leq 169$ | 3         |
| $170 \leq x \leq 179$ | 3         |
| $180 \leq x \leq 189$ | 2         |
| <b>Total</b>          | <b>35</b> |

3.6 We construct a histogram using the frequency count.



(5)

3.7 The modal class is the interval with the highest frequency.  
Therefore, it is  $140 \leq x \leq 149$ .

(1)

3.8 There are 16 out of 35 households that spend less than R145 per month. Therefore, the percentage is  $\frac{16}{35} \times 100 = 45.71\%$ .

(2)

## Question 4

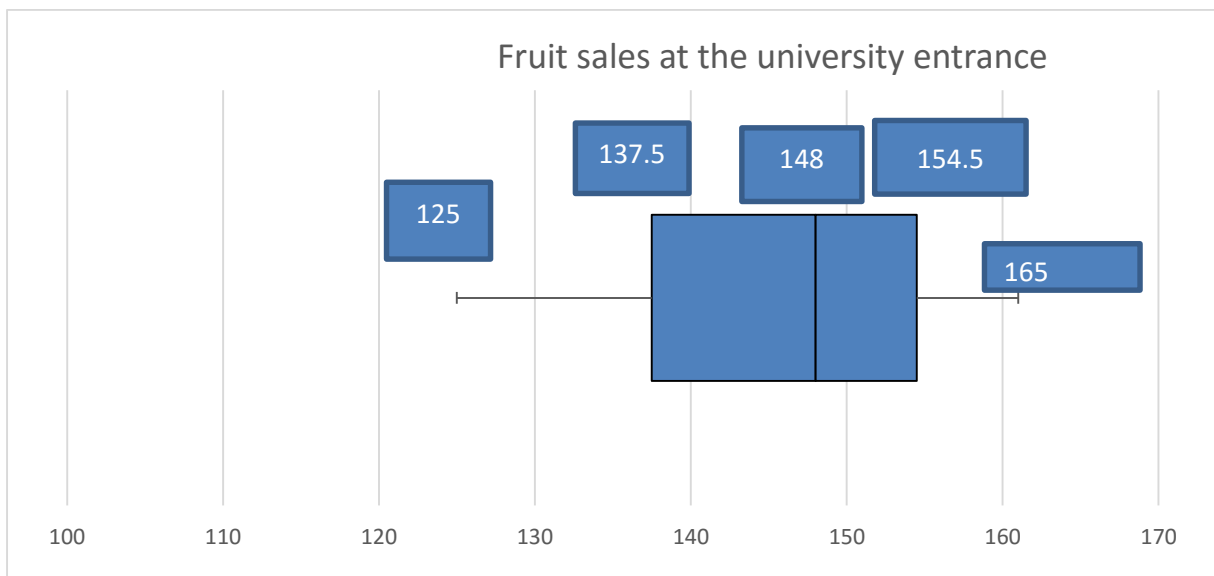
4.1 To draw a back-to-back ordered stem and leaf plot, firstly, you start by arranging the data (both hospital and university) in ascending order.

| Hospital leaf                     | Stem | University leaf       |
|-----------------------------------|------|-----------------------|
| 5                                 | 12   | 5 5 5                 |
| 0 0                               | 13   | 0 6 6 6 9             |
| 5 5                               | 14   | 5 5 5 6 7 7 8 8 9 9 9 |
| 8                                 | 15   | 0 4 4 5 5 5 6 6       |
| 9 8 7 5 5 0                       | 16   | 5 5                   |
| 9 9 8 8 6 6 5 5 5 5 2 1 1 0 0 0 0 | 17   |                       |

(10)

4.2 The box plot is constructed from the five-number summary, which is minimum value, lower quartile, median, upper quartile and maximum value.

NOTE: You MUST always remember to arrange your data in ascending order to compute the five-number summary.



(8)



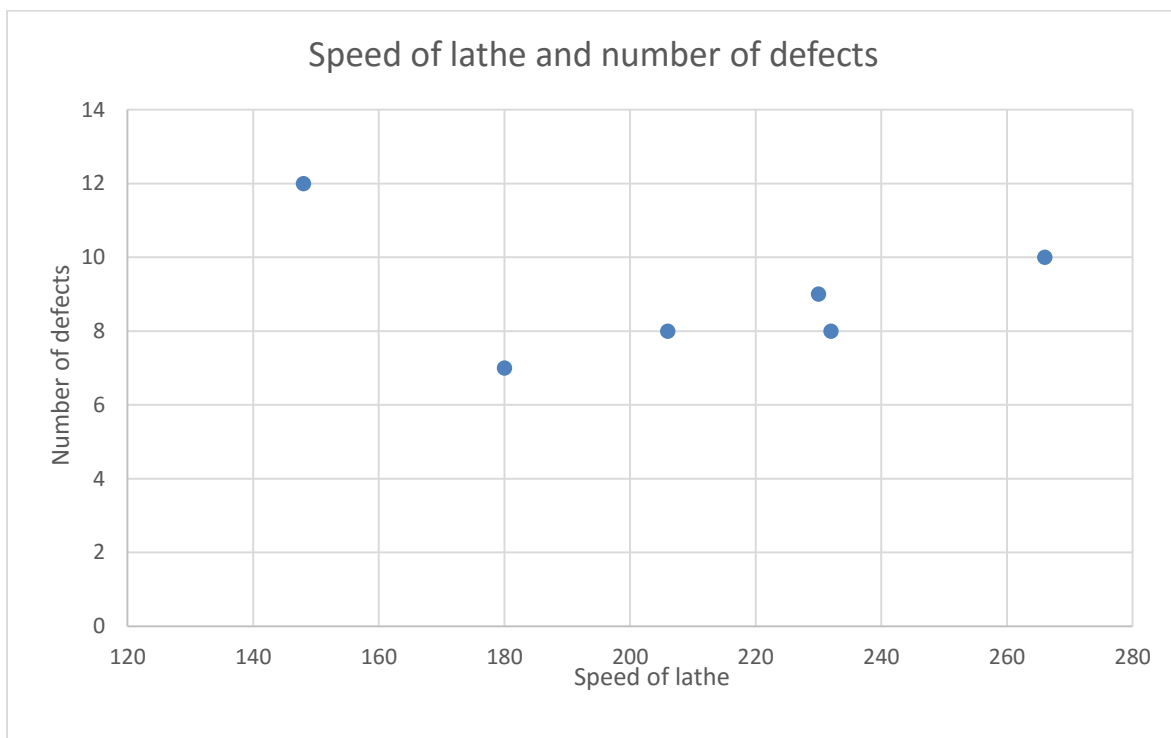
## Question 5

5.1

X = Independent variable = Speed of lathe (1)

Y = Dependent variable = Number of defects(1)

5.2



(4)

5.3 Positive, medium, linear relationship

(1)

**Question 6**

WW, LL, DL, LD, DD, WL, LW, WD, DW (4)

**Question 7**

7.1  $\frac{4}{12} = \frac{1}{3}$  (2)

7.2  $\frac{8}{12} = \frac{2}{3}$  (2)

7.3  $\frac{8}{12} = \frac{2}{3}$  (4)

7.4  $\frac{7}{11}$  (4)

**Question 8**

8.1

|   |   | Seven-sided polyhedron 1 (sides labelled 0–6) |     |     |     |     |     |     |
|---|---|---|-----|-----|-----|-----|-----|-----|
| Seven-sided polyhedron 2 (sides labelled 0-6) |   | 0   | 1   | 2   | 3   | 4   | 5   | 6   |
|   | 0 | 0,0   | 0,1 | 0,2 | 0,3 | 0,4 | 0,5 | 0,6 |
|   | 1 | 1,0   | 1,1 | 1,2 | 1,3 | 1,4 | 1,5 | 1,6 |
|   | 2 | 2,0   | 2,1 | 2,2 | 2,3 | 2,4 | 2,5 | 2,6 |
|   | 3 | 3,0   | 3,1 | 3,2 | 3,3 | 3,4 | 3,5 | 3,6 |
|   | 4 | 4,0   | 4,1 | 4,2 | 4,3 | 4,4 | 4,5 | 4,6 |
|   | 5 | 5,0   | 5,1 | 5,2 | 5,3 | 5,4 | 5,5 | 5,6 |
|   | 6 | 6,0   | 6,1 | 6,2 | 6,3 | 6,4 | 6,5 | 6,6 |

(9)

8.2  $\frac{2}{49}$  (3)

8.3  $\frac{24}{49}$  (3)

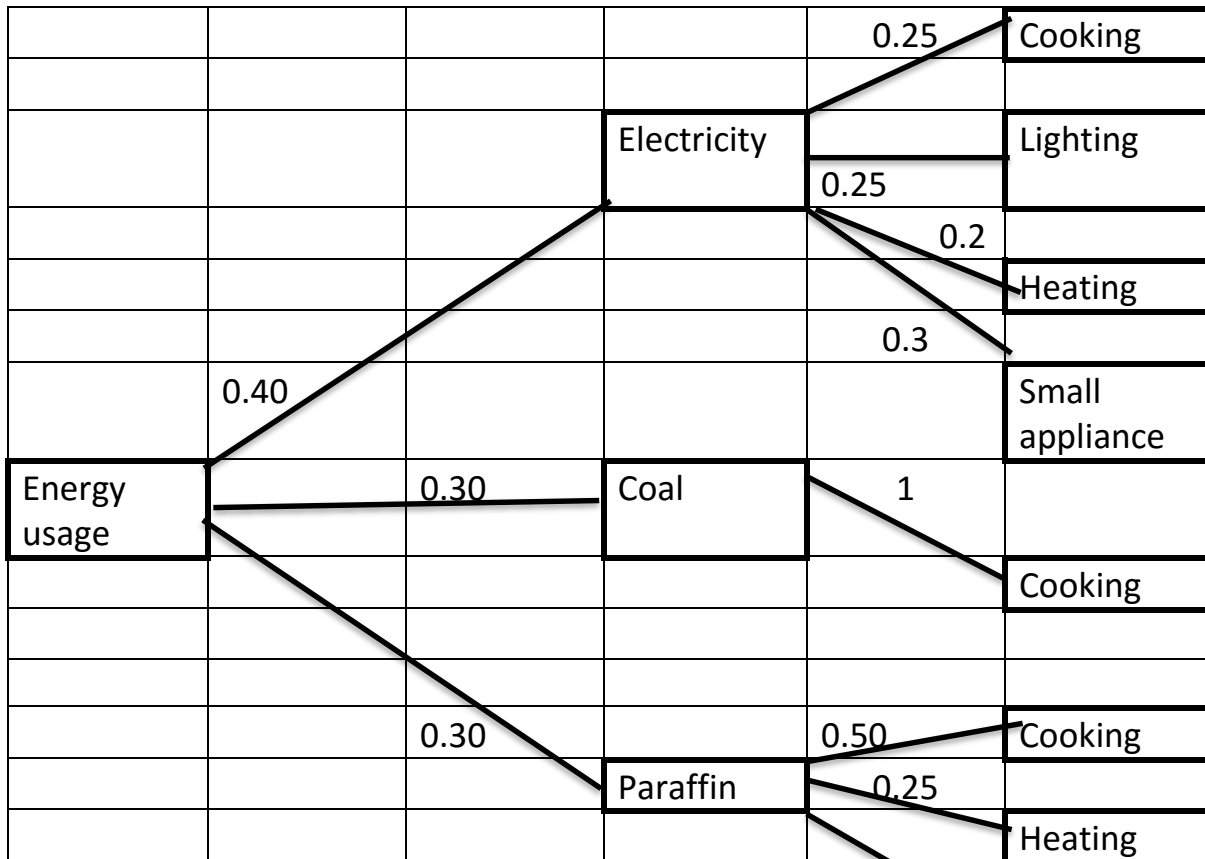
8.4  $\frac{24}{49}$  (3)

8.5  $\frac{11}{49}$  (3)

8.6  $\frac{34}{49}$  (3)

**Question 9**

9.1



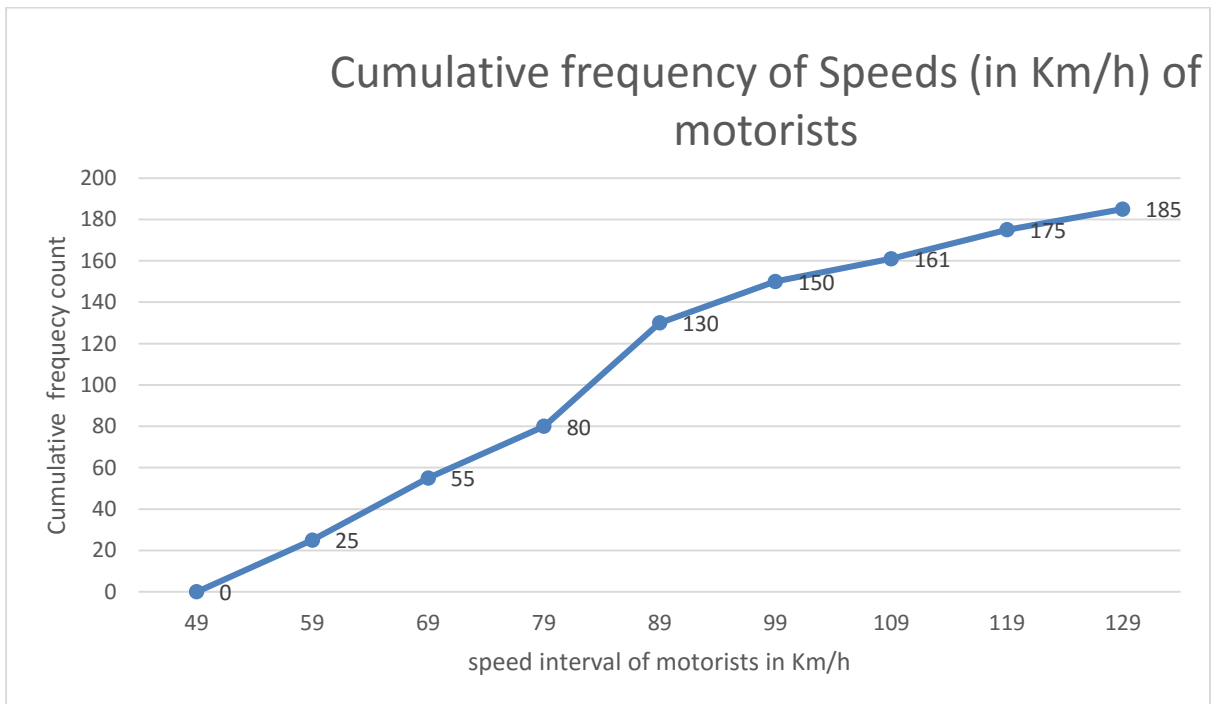
|  |  |  |  |      |          |
|--|--|--|--|------|----------|
|  |  |  |  | 0.25 |          |
|  |  |  |  |      | Lighting |
|  |  |  |  |      |          |

(11)

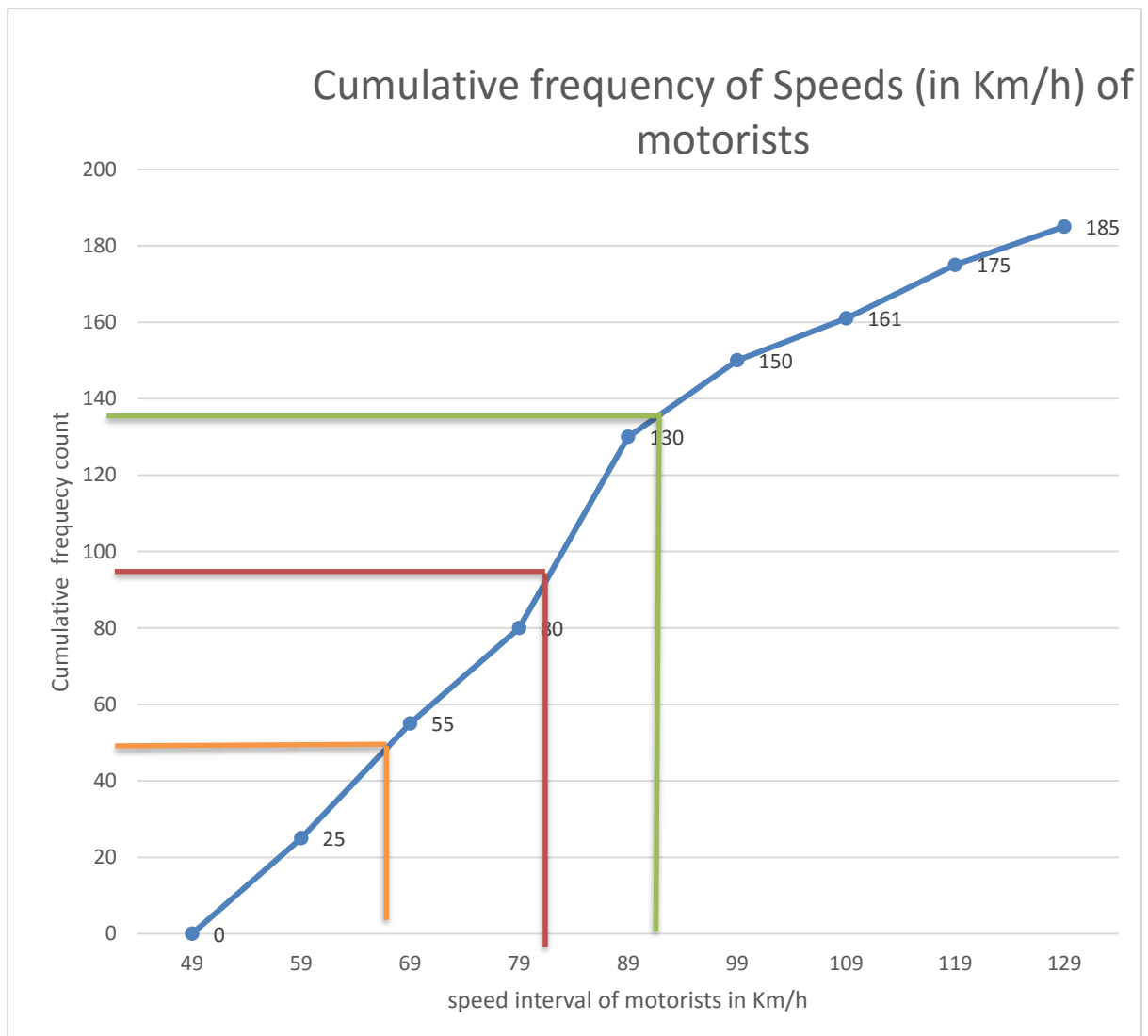
9.2 Probability for using electricity for lighting

$$0.40 \times 0.25 = 0.1 \quad (3)$$

**Question 10**



(7)



10.2.1 Median position =  $\frac{1}{2}$  of 185 = 92.5<sup>th</sup> position

Draw a line from 92.5 at the vertical axis across the curve and down, then read the horizontal axis. We then get a median of 82.5  $\approx$  83. Therefore, the median is 83. (2)

10.3.2 Interquartile range

(a) Upper quartile position =  $\frac{3}{4}$  of 185 = 138.75<sup>th</sup> position (1)

Draw a line from 138.75 at the vertical axis across the curve and down, then read the horizontal axis. We then get a median of  $94.4 \approx 94$ . Therefore, the upper quartile is 94. (1)

(b) Lower quartile position =  $\frac{1}{4}$  of 185 = 46.25<sup>th</sup> position (1)

Draw a line from 46.25 at the vertical axis across the curve and down, then read the horizontal axis. We then get a median of  $67.1 \approx 67$ . Therefore, the lower quartile is 67. (1)

$$\begin{aligned} \text{Interquartile range} &= \text{Upper quartile} - \text{Lower quartile} \\ &= 94 - 67 \\ &= 27 \end{aligned} \quad (1)$$

$$\begin{aligned} 10.2.3 \text{ The semi-interquartile range} &= (\text{Upper quartile} - \text{Lower quartile}) \\ &= (27) \div 2 \\ &= 13.5 \end{aligned} \quad (1)$$

[15]

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The End

### Marking Rubric

| Semester1 MAE202N ASSIGNMENT 02 |                   |  |           |
|---------------------------------|-------------------|--|-----------|
| Marked Questions                | Mark per question |  | Your mark |
| Question 2                      | 10                |  |           |
| Total                           | 10                |  |           |
|                                 |                   |  |           |
| Question 3                      |                   |  |           |

|                   |            |  |  |
|-------------------|------------|--|--|
| 3.1.1             | 2          |  |  |
| 3.1.2             | 2          |  |  |
| 3.2               | 2          |  |  |
| 3.3.1             | 3          |  |  |
| 3.3.2             | 2          |  |  |
| 3.3.3             | 7          |  |  |
| 3.3.4             | 2          |  |  |
| 3.4               | 2          |  |  |
| 3.5               | 5          |  |  |
| 3.6               | 5          |  |  |
| 3.7               | 1          |  |  |
| 3.8               | 2          |  |  |
| <b>Total</b>      | <b>35</b>  |  |  |
| <b>Question 4</b> |            |  |  |
| 4.1               | 10         |  |  |
| 4.2               | 8          |  |  |
| <b>Total</b>      | <b>18</b>  |  |  |
| <b>Question 5</b> |            |  |  |
| 5.1               | 2          |  |  |
| 5.2               | 4          |  |  |
| 5.3               | 1          |  |  |
| <b>Total</b>      | <b>7</b>   |  |  |
| <b>Question 6</b> |            |  |  |
| <b>Total</b>      | <b>4</b>   |  |  |
| <b>Question 7</b> |            |  |  |
| 7.1               | 2          |  |  |
| 7.2               | 2          |  |  |
| 7.3               | 4          |  |  |
| 7.4               | 4          |  |  |
| <b>Total</b>      | <b>12</b>  |  |  |
| <b>Question 8</b> |            |  |  |
| 8.1               | 9          |  |  |
| 8.2               | 3          |  |  |
| 8.3               | 3          |  |  |
| 8.4               | 3          |  |  |
| 8.5               | 3          |  |  |
| 8.6               | 3          |  |  |
| <b>Total</b>      | <b>24</b>  |  |  |
| <b>Final</b>      | <b>110</b> |  |  |