

MATU9D2 : Practical Statistics

Practical 1 : Hand Calculation : Solutions

Q1. (i) Minimum = 14 Maximum = 28

$n = 30$

$\sqrt{30} = 5 \text{ or } 6 \text{ mos}$

$Q_1 = \text{lower quartile} = \frac{(n+1) \text{th smallest}}{4} = 7.75 \text{ smallest}$

1 4 5

1 7 7 6

1 8 9 9 9 8 8

2 0 1 1 0 1 0 0

2 3 2 2 2 3 2

2 4 4 4

2 6 6

2 8

Stem Unit = 10

leaf Unit = 1

Increment = 2

← Unordered

$Q_3 = \text{Upper quartile} = \frac{3(n+1) \text{th smallest}}{4} = 23.25 \text{ smallest}$

23rd smallest = 23

24th smallest = 23

So 0.25 way between = 23.75

30

	20.5
13	23
14	28

Stem Unit = 10

leaf Unit = 1

← Ordered

Always create an ordered

Stem & leaf Plot

(iii) Mild outliers if data < $Q_1 - 1.5(Q_3 - Q_1)$

or data > $Q_3 + 1.5(Q_3 - Q_1)$

$Q_3 - Q_1 = 23 - 18 = 5$ $1.5 \times (Q_3 - Q_1) = 1.5 \times 5 = 7.5$

$Q_1 - 1.5(Q_3 - Q_1) = 18 - 7.5 = 10.5$

$Q_3 + 1.5(Q_3 - Q_1) = 23 + 7.5 = 30.5$

(ii) Minimum = 14 Maximum = 28

Median = $\frac{(n+1) \text{th smallest}}{2} = \frac{30+1}{2} = 15.5 \text{th smallest}$

15th = 20 16th = 21

So half way between

$= \frac{20+21}{2} = 20.5$

No data < 10.5 and no data > 30.5
so no mild outliers & therefore no extreme outliers

(iv) See graph paper

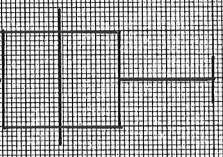
(v) $n=30$ $\Sigma x = 619$ $\Sigma x^2 = 13091$

$\bar{x} = \frac{\Sigma x}{n} = \frac{619}{30} = 20.63$

Q1 (No)

30

28
26
24
22
20
18
16
14
12



$$s = \sqrt{\frac{1}{n-1} \left[\sum x^2 - \frac{(\sum x)^2}{n} \right]} = \sqrt{\frac{1}{29} \left[13091 - \frac{619^2}{30} \right]}$$

$$= \sqrt{\frac{318.9667}{29}} = \sqrt{10.9988}$$

$$= 3.316 //$$

ie Mean is 20.63 kgs & Standard Deviation is 3.316 kgs.

(vi) Median = 20.5 Mean = 20.63

They are close which suggests that the distribution is symmetric.
Looking at the stem & leaf plot - it is "

(vii) Appropriate measures of location & spread are the mean and standard deviation respectively.

This is because the stem & leaf is unimodal, symmetric & has no outliers.

(Shape of distribution - widely spread, unimodal, symmetric, no gaps & no outliers.)

Q2. (i) The data is quantitative so could draw a stem & leaf, histogram or boxwhisker plot.

$$n = 29 \quad \sqrt{29} \approx 5 \text{ or } 6 \text{ rows} \quad \text{Minimum} = 4.9 \\ \text{Maximum} = 5.9$$

Stem Unit = 1	4	9
Leaf Unit = 0.1	5	1 1
Increment = 0.2	5	3 3 3 3 3 3
	5	4 4 4 4 5 5 5
	5	6 6 6 6 6 6 7
	5	8 8 9

(iv) The stem & leaf is negatively skewed so median & IQR would be the appropriate measures of location & spread respectively for this data set.

Note Mean < Median i.e. $5.455 < 5.5$
This is as expected since the data is negatively skewed.

(ii) Minimum = 4.9 Maximum = 5.9

$$\text{Median} = \frac{(n+1)\text{th smallest}}{2} = \frac{29+1}{2} = \frac{30}{2} = 15\text{th smallest} = 5.5 //$$

$$Q_1 = \frac{(n+1)\text{th smallest}}{4} = 7.5\text{th smallest} = 5.3 //$$

$$Q_3 = \frac{3(n+1)\text{th smallest}}{4} = 22.5\text{th smallest} = 5.6 //$$

# 29	5.5	5.6	5.9
	5.3		
	4.9		

1 Widely spread
2 Unimodal
3 Negatively skewed
4 No gaps
5 No outliers

(iii) $n = 29 \quad \Sigma x = 158.2 \quad \Sigma x^2 = 864.4$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{158.2}{29} = 5.455 //$$

$$s = \sqrt{\frac{1}{n-1} \left[\Sigma x^2 - \frac{(\Sigma x)^2}{n} \right]} = \sqrt{\frac{1}{28} \left[864.4 - \frac{158.2^2}{29} \right]} = \sqrt{0.049} = 0.223 //$$