

Statistics 3 - Measures of spread

SOLUTIONS

Section 1

1, $\bar{x} = \underline{9.17}$ (to 3sf)

$Q_2 = \underline{7.5}$

Mode = 5

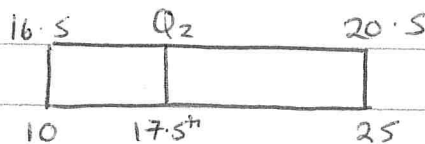
2,

x	f
6.5 - 10.5	3
10.5 - 16.5	7
16.5 - 20.5	15
20.5 - 28.5	8
28.5 - 35.5	2

mean = 18.79 (to 2dp)
(from Calc.)

modal group = 16.5 ≤ x < 20.5
(17 ≤ x < 20)
fine too!

$n=35$ $Q_2 = \frac{35}{2} = 17.5^{th}$ → in 16.5 - 20.5th group



$$\frac{Q_2 - 16.5}{20.5 - 16.5} = \frac{17.5 - 10}{25 - 10}$$

$Q_2 = 18.5$

Q4,

1	1 7
2	③ 3
3	1 ④ 7
4	1 ③
5	2 6

$n=11$

$Q_2 = 34$

$Q_1 = \frac{11}{4} = 2.75^{th} = 3^{rd} = 23$

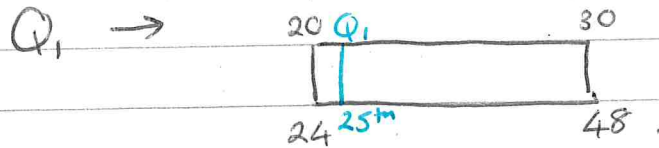
$Q_3 = 8.25^{th} = 9^{th} = 43$

Q3, $n = 100$

$$Q_1 = 25^{\text{th}} \rightarrow 20 - 30 \text{ group.}$$

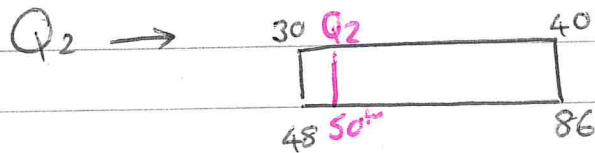
$$Q_2 = 50^{\text{th}} \rightarrow 30 - 40 \text{ group.}$$

$$Q_3 = 75^{\text{th}} \rightarrow 30 - 40 \text{ group.}$$



$$\frac{Q_1 - 20}{30 - 20} = \frac{25 - 24}{48 - 24}$$

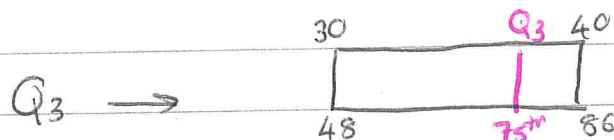
$$Q_1 = \underline{\underline{20 \cdot 4}}$$



$$\frac{Q_2 - 30}{40 - 30} = \frac{50 - 48}{86 - 48}$$

$$Q_2 = 30 \cdot 5$$

$$= \underline{\underline{30 \cdot 6}}$$



$$\frac{Q_3 - 30}{40 - 30} = \frac{75 - 48}{86 - 48}$$

$$Q_3 = \underline{\underline{37 \cdot 5}}$$

Section 2

$$1, \quad n=20 \quad \bar{x} = \frac{22}{20} = \underline{1.1} \quad \checkmark \quad s.d. = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2} \quad \checkmark$$
$$= \sqrt{\frac{55}{20} - \left(\frac{22}{20}\right)^2}$$
$$= \underline{1.24} \quad (\text{to 3sf}) \quad \checkmark \quad (3)$$

$$2, \quad a, \quad s.d. = \underline{2.35} \quad \checkmark \quad (1)$$

$$b, \quad \bar{x} = 5.925 \quad \checkmark$$

$$\bar{x} + s.d. = 5.925 + 2.35 = 7.675 \quad \checkmark$$

$$\therefore 5 + 2 + 1 = \underline{8 \text{ students}} \quad \checkmark \quad (3)$$

$$3, \quad \bar{x} = \frac{\sum x}{n}$$

$$163.52 = \frac{\sum fx}{50}$$

$$\sum fx = 50 \times 163.52$$

$$= \underline{8176} \quad \checkmark \quad (1)$$

$$s.d. = \sqrt{\frac{\sum fx^2}{n} - (\bar{x})^2}$$

$$2.53 = \sqrt{\frac{\sum fx^2 - 163.52^2}{50}}$$

$$\sum fx^2 = \underline{1,337,259.565} \quad \checkmark \quad (1)$$

$$\text{New } \sum fx = 8176 + 162 + 170$$
$$= 8508$$

$$\text{New } \bar{x} = \frac{8508}{52}$$

$$= \underline{163.62} \quad \checkmark$$

$$\text{New } \sum fx^2$$

$$= 1,337,259.565$$

$$+ 162^2 + 170^2$$

$$= 1,392,403.565$$

$$\text{New } s.d. = \sqrt{\frac{1,392,403.565 - \left(\frac{8508}{52}\right)^2}{52}}$$

$$= 2.645$$

$$= \underline{2.65} \quad \checkmark \quad (2)$$

		On Calc		
4, a,	0	7	$\bar{x} = 1.07$	✓
	1.5	4	$s.d = 1.19$	✓ (2)
	3	3		

b, Rainfalls between 0 and 2.26 are within 1 standard deviation of the mean. (2)

$$\bar{x} \pm 1.19 \begin{cases} 1.07 - 1.19 = -0.12 \text{ (not possible)} \\ \text{so } = 0 \\ 1.07 + 1.19 = 2.26 \end{cases}$$

c, Not suitable as she only used 1 location in the UK and for 1 month, and she was wanting to investigate rainfall in UK in 2015. (1)

(- She has only done 14 days - it is not enough to just say this to get the mark
- you must comment on location & month)

d, Use more UK locations and more months from May - Oct. (1)

(Must refer to UK - not just a general statement of "more data")

$$5, \quad \bar{x} = 15 \quad 15 = \frac{\sum x}{50} \quad \left| \quad s.d = \sqrt{\frac{\sum x^2}{50} - 15^2}$$

$$\underline{\sum x = 750} \quad \left| \quad 48 = \frac{\sum x^2}{50} - 15^2$$

variance!!

$$\underline{\underline{\sum x^2 = 13650}}$$

(3)

$$6, \quad n=20 \quad \sum x = 100 \quad \sum x^2 = 1240$$

$$n=25 \quad \sum y = 144 \quad \sum y^2 = 1600$$

$$\bar{x} = \frac{100+144}{45} \checkmark$$
$$= \underline{\underline{5.42}} \checkmark$$

$$s.d = \sqrt{\frac{1240+1600}{45} - 5.42^2} \checkmark$$

$$\underline{\underline{s.d = 5.81}} \checkmark \quad (5)$$

25

