

Statistics 1

Measures of central tendency - SOLUTIONS

Section 1

1, a, Positive correlation

b, 86 cm. (Allow 84 - 89)

2,

	London	York	Total
Boys	23	14	37
Girls	19	24	43
	42	38	80

b, $P(\text{London}) = \frac{42}{80} = \frac{21}{40}$

3, a, $P(\text{Both "i"}) = \frac{2}{7} \times \frac{1}{6} = \frac{2}{42} = \frac{1}{21}$

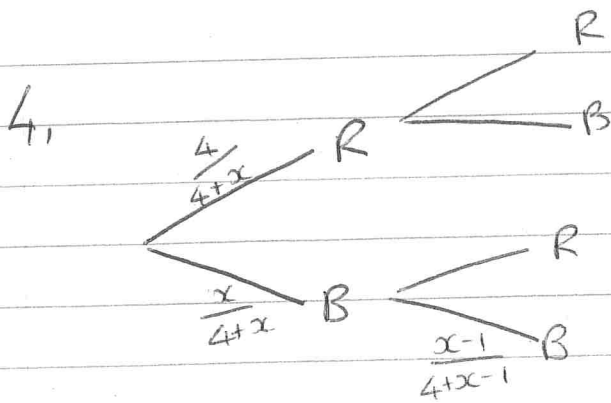
b,

	1 st	2 nd	
1 st	1	2	3
1	1,1	1,2	1,3
2	2,1	2,2	2,3
3	3,1	3,2	3,3

$$P(1, 2) = \frac{2}{7} \times \frac{3}{6} = \frac{1}{7}$$

$$P(1, 3) = \frac{2}{7} \times \frac{2}{6} = \frac{2}{21}$$

$$P(2^{\text{nd}} > 1^{\text{st}}) = \frac{1}{7} + \frac{2}{21} = \frac{5}{21}$$



a, $P(BB) = \frac{x}{4+x} \times \frac{x-1}{3+x} = \frac{1}{3}$

$$3x(x-1) = (4+x)(3+x)$$

$$3x^2 - 3x = 12 + 4x + 3x + x^2$$

$$2x^2 - 10x - 12 = 0$$

$$\underline{x^2 - 5x - 6 = 0}$$

b, $(x-6)(x+1) = 0$
 $\underline{x=6}, \underline{x=-1} \quad \therefore \underline{x=6}$

Section 2

1,	<u>8-10</u>	<u>11-15</u>
Boundaries	$7.5 \leq x < 10.5$ ✓	$10.5 \leq x < 15.5$ ✓
Midpoints	= 9 ✓	= 13 ✓
class width =	3 ✓	= 5. ✓ (6)

2. Advantages → ① ✓ It makes the data faster to work with
 ② ✓ A large amount of data can be presented in graphs

Disadvantages → ① ✓ You lose accuracy when calculating averages etc.
 ② ✓ Can be time consuming to group/decide on groups

$$3, a, \text{ Mean} = \frac{368 + 679 + 612 + 1391 + 1008 + 117}{40}$$

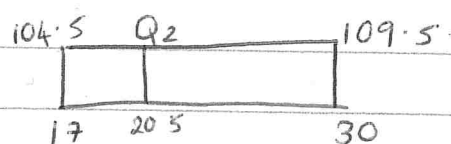
$$= 104.375$$

$$= \underline{104.4 \text{ kg}}$$

$$b, \text{ Median} = \frac{40}{2} = 20^{\text{th}} \Rightarrow 20.5^{\text{th}} \text{ Value}$$

20.5^{th} Value is in group $105-109$

$$\Rightarrow 104.5 \leq m < 109.5$$



$$\frac{Q_2 - 104.5}{109.5 - 104.5} = \frac{20.5 - 17}{30 - 17}$$

$$Q_2 = 105.846$$

$$= \underline{105.8 \text{ kg}}$$

c, Modal group $\Rightarrow 104.5 \leq m < 109.5$ (Allow 104-109)

d, They are only estimates as the data in the table is grouped.

(8)

4, a, Mode = 8 ✓

2, 2, 3, 3, 4, 6, 7,
8, 8, 8, 10, 11, 12

b, Median = $\frac{13}{2} = 6.5^{\text{th}} = 7^{\text{th}}$ ✓

c, $Q_1 = \frac{13}{4} = 3.25 = 4^{\text{th}} = 3$ ✓

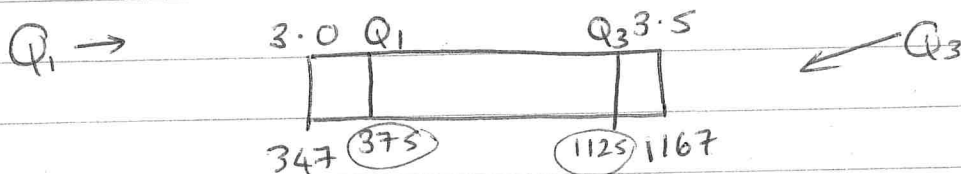
$Q_3 = 3(\frac{13}{4}) = 9.75 = 10^{\text{th}} = 8$ ✓ (4)

5, a, Missing 2.75, 5.50 ✓ ✓ (2)

b, Mean = $\frac{4841}{1500} = 3.2273 = 3.2$ ✓ (2)
(or calculator use)

c, $Q_1 = \frac{1500}{4} = 375^{\text{th}}$ ✓ → in group 3-3.5
(do not need to change as data is grouped)

$Q_3 = 3(\frac{500}{4}) = 1125^{\text{th}}$ ✓ → in group 3-3.5.



$\frac{Q_1 - 3.0}{3.5 - 3.0} = \frac{375 - 347}{1167 - 347}$

$\frac{Q_3 - 3.0}{3.5 - 3.0} = \frac{1125 - 347}{1167 - 347}$

$Q_3 = 3.474$ ✓

$Q_1 = 3.017$ ✓

∴ IQR = $3.474 - 3.017$
= 0.457 (to 3sf) ✓

(6) ✓

$$6_{10}, P(\text{Work} > 24.5 \text{ mins}) = \frac{11}{55} \times \frac{10}{54} = \frac{1}{5} \quad \checkmark \quad (2)$$

$$b, \quad \text{Mean} = \frac{1060}{55} = 19.\dot{2}\dot{7} = \underline{19.3} \text{ mins} \quad \checkmark \quad (2)$$

c, For 80 weeks.

$$\bar{x} = 21$$

$$n = 80$$

For 55 weeks

$$\bar{x} = 19.3$$

$$n = 55$$

$$\bar{x} = \frac{\sum x}{n} \quad \therefore \sum x = 21 \times 80 = 1680 \quad \checkmark$$

$$\therefore \sum x = 19.3 \times 55 = 1060 \quad \checkmark$$

$$\therefore \text{for } \sum x \text{ for last 25 weeks} \\ = 1680 - 1060 \\ = 620 \quad \checkmark$$

$$\therefore \bar{x} = \frac{620}{25} = \underline{24.8} \quad \checkmark \quad (4)$$

d, The average time spent on the 'phone in the last 25 weeks is ~~an~~ higher than in the first 55 weeks. \checkmark (2)

Q7,

$$\bar{x} = 39.35 \quad \checkmark$$

$$\text{Median} = 40 \quad \checkmark$$

$$\text{Mode} = \text{No mode.} \quad \checkmark$$

Not on Calc. \checkmark (3)

b,

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

$$n=23 \quad Q_1 = \frac{23}{4} = 5.75 = 6^{\text{th}} \text{ value} = \underline{\underline{31}} \quad \checkmark$$

$$Q_2 = \frac{23}{2} = 11.5 = 12^{\text{th}} \text{ value} = \underline{\underline{42}} \quad \checkmark$$

$$Q_3 = \frac{23}{4} \times 3 = 17.25 = 18^{\text{th}} \text{ value} = \underline{\underline{55}} \quad \checkmark \quad (3)$$

i, There is no mode under 60, if the mode is over 60, these people have failed to solve the puzzle in time. \checkmark (1)

ii, The largest time taken is unknown so it is not possible to find the range. \checkmark (1)

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