

3.4 Answers

A-level Statistics : Year 1 Partitioning Data

3.4.1 Solution to the 3.2 Example

To calculate which class the median is in;

For the median : $\frac{141}{2} = 70.5$ which is in the class 3 - 3.9

Do not apply ARU (Always Round Up) as the individual pieces of data are not known. The class sought is 3.0 - 3.9 but notice the gaps between the classes given in the table. This means that the class we are interested in is slightly larger than given in the table. (That is, 2.95 - 3.95)

Linear Interpolation :

$$\begin{array}{ccc} 2.95 & m & 3.95 \\ \bullet & \bullet & \bullet \\ 54 & 70.5 & 113 \\ \frac{m - 2.95}{3.95 - 2.95} = \frac{70.5 - 54}{113 - 54} \\ m = 3.23 \text{ g} \end{array}$$

3.4.2 Solution to the 3.3 Exercise

Answer 1

(i)

time (to nearest minute)	Number of parents	Cumulative frequency
1 - 15	115	115
16 - 25	46	161
26 - 35	36	197
36 - 55	22	219
56 - 80	14	233

For the median : $\frac{233}{2} = 116.5$ which is in the class 16 - 25

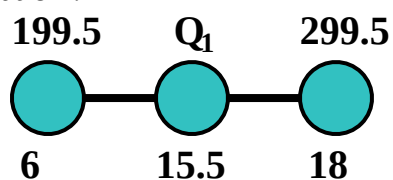
Linear Interpolation :

$$\begin{array}{ccc} 15.5 & m & 25.5 \\ \bullet & \bullet & \bullet \\ 115 & 116.5 & 161 \\ \frac{m - 15.5}{25.5 - 15.5} = \frac{116.5 - 115}{161 - 115} \\ m = 15.83 \text{ minutes} & & (15 \text{ minutes } 50 \text{ seconds}) \end{array}$$

Answer 2**(i)**

Mass kg	Frequency	Cumulative frequency
100 - 199	6	6
200 - 299	12	18
300 - 399	20	38
400 - 499	14	52
500 - 599	10	62

For Q_1 : $\frac{62}{4} = 15.5$ which is in the class 200 - 299

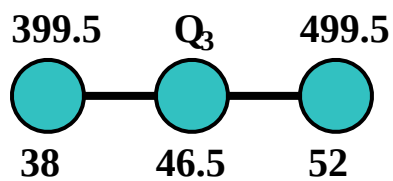
(ii) Linear interpolation :

$$\frac{Q_1 - 199.5}{299.5 - 199.5} = \frac{15.5 - 6}{18 - 6}$$

$$Q_1 = 278.7 \text{ kg}$$

For Q_3 : $\frac{3 \times 62}{4} = 46.5$ which is in the class 400 - 499

Linear interpolation :



$$\frac{Q_3 - 399.5}{499.5 - 399.5} = \frac{46.5 - 38}{52 - 38}$$

$$Q_3 = 460.2 \text{ kg}$$

(iii) Thus the interquartile range is 181.5 kg

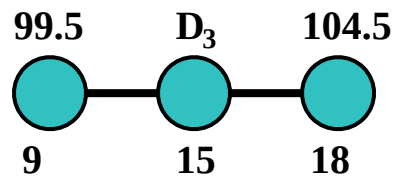
Answer 3

service speed (mph)	Number of serves	cumulative frequency
90 - 94	2	2
95 - 99	7	9
100 - 104	9	18
105 - 109	14	32
110 - 114	9	41
115 - 119	4	45
120 - 124	3	48
125 - 129	2	50

(i)

For D_3 : $\frac{3 \times 50}{10} = 15$ which is in the class 100 - 104

Linear interpolation :



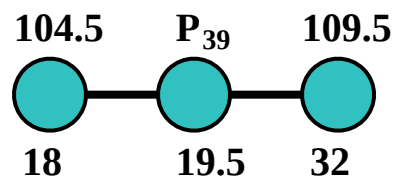
$$\frac{D_3 - 99.5}{104.5 - 99.5} = \frac{15 - 9}{18 - 9}$$

$$D_3 = 102.8 \text{ mph}$$

(ii)

For P_{39} : $\frac{39 \times 50}{100} = 19.5$ which is in the class 105 - 109

Linear interpolation :



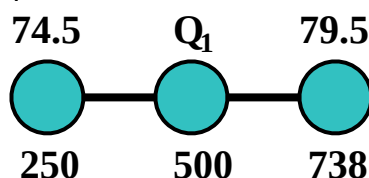
$$\frac{P_{39} - 104.5}{109.5 - 104.5} = \frac{19.5 - 18}{32 - 18}$$

$$D_3 = 105.0 \text{ mph}$$

Answer 4

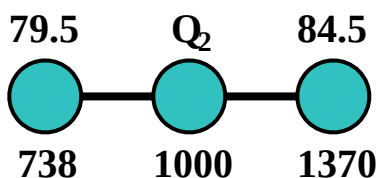
length (to nearest cm)	Number of fish	Cumulative frequency
60 - 64	11	11
65 - 69	49	60
70 - 74	190	250
75 - 79	488	738
80 - 84	632	1370
85 - 89	470	1840
90 - 94	137	1977
95 - 99	23	2000

For Q_1 : $\frac{2000 \times 1}{4} = 500$ which is in the class 75 - 79



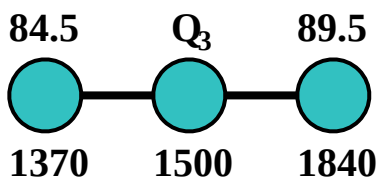
$$\frac{Q_1 - 74.5}{79.5 - 74.5} = \frac{500 - 250}{738 - 250} \Rightarrow Q_1 = 77.06 \text{ cm}$$

For Q_2 : $\frac{2000 \times 2}{4} = 1000$ which is in the class 80 - 84



$$\frac{Q_2 - 79.5}{84.5 - 79.5} = \frac{1000 - 738}{1370 - 738} \Rightarrow Q_2 = 81.57 \text{ cm}$$

For Q_3 : $\frac{2000 \times 3}{4} = 1500$ which is in the class 85 - 89



$$\frac{Q_3 - 84.5}{89.5 - 84.5} = \frac{1500 - 1370}{1840 - 1370} \Rightarrow Q_3 = 85.88 \text{ cm}$$

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