Measures of location and spread 2D

1 a CF = 4 8 10 17 37 61 71
71 slow worms were measured.

b $Q_1: \frac{71}{4} = 17.75$th value, so Q_1 is in class $185-199$

$$\frac{Q_1 - 184.5}{199.5 - 184.5} = \frac{17.75 - 17}{37 - 17}$$

$$Q_1 - 184.5 = 0.5625$$

$$Q_1 = 185.0625$$

$$Q_3 : 3 \times \frac{71}{4} = 53.25\text{th value}$$

so Q_3 is in class $200 - 214$

$$\frac{Q_3 - 199.5}{214.5 - 199.5} = \frac{53.25 - 37}{61 - 37}$$

$$Q_3 - 199.5 = \frac{243.75}{24}$$

$$Q_3 = 209.656$$

$$\text{IQR} = 209.656 - 185.0625$$
$$= 24.6 \text{ (3 s.f.)}$$

c $$\bar{x} = \frac{(132 \times 4) + (147 \times 4) + (162 \times 2) + (177 \times 7) + (192 \times 20) + (207 \times 24) + (222 \times 10)}{71}$$

$$= \frac{13707}{71}$$
$$= 193.1\text{mm (to 1 d.p.)}$$

d $$\bar{x} + \text{IQR} = 193.1 + 24.6$$
$$= 217.7$$

217.7 is in the class interval 215−229

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1 d Using interpolation:

$$\frac{217.7-214.5}{229.5-214.5}=\frac{y-61}{71-61}$$

$$y = 63.13...$$

$$71 - y = 7.87$$

7 slow worms have that length.

2 a 34th: $\frac{34}{100}\times 70 = 23.8$

$$\frac{P_{34}-1000}{1100-1000}=\frac{23.8-3}{27-3}$$

$$P_{34} = 1086.7$$

66th: $\frac{66}{100}\times 70 = 46.2$

$$\frac{P_{66}-1100}{1200-1100}=\frac{46.2-27}{55-27}$$

$$P_{66} = 1168.57$$

34% to 66% interpercentile range $= P_{66} - P_{34} = 1168.57 - 1086.7 = £81.87$

b $46.2 - 23.8 = 22.4$
So 22 data values

3 a 5th: $\frac{5}{100}\times 60 = 3$

$$\frac{P_5-14.5}{16.5-14.5}=\frac{3-0}{5-0}$$

$$P_5 = 15.7$$

95th: $\frac{95}{100}\times 60 = 57$

$$\frac{P_{95}-20.5}{22.5-20.5}=\frac{57-50}{60-50}$$

$$P_{95} = 21.9$$

5% to 95% interpercentile range $= 21.9 - 15.7 = 6.2$

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3 b $57 - 3 = 54$
So 54 data values

4 a 14.3, 12.7, 12.4, 10.9, 9.4, 13.2, 12.1, 10.3, 10.3, 10.6

Q_2 = 5.5th value = $\frac{10.9+12.1}{2} = 11.5$
Q_1 = 3rd value = 10.3
Q_3 = 8th value = 12.7

IQR = $12.7 - 10.3 = 2.4$

b On average, the temperature was higher in June than in May as the median is higher. However, the temperature was more variable in May than in June, as the IQR is higher.

c 10th: $\frac{10}{100} \times 31 = 3.1$
90th: $\frac{90}{100} \times 31 = 27.9$

$27.9 - 3.1 = 24.8$

So 24 days

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