Statistics 1   Solution Bank

Exercise 2E

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

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

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

$Q_1 - 184.5 = 0.5625$

$Q_1 = 185.0625$

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

So Q_3 is in class $200 - 214$

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

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

$$Q_3 = 209.656$$

IQR $= 209.656 - 185.0625$
$= 24.6$ (3 s.f.)

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

$= \dfrac{13\,707}{71}$
$= 193.1$ mm (to 1 d.p.)

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

217.7 is in the class interval $215-229$

Using interpolation:

$$\frac{217.7 - 214.5}{229.5 - 214.5} = \frac{y - 61}{71 - 61}$$
$$y = 63.13 \ldots$$
$$71 - y = 7.87$$

7 slow worms have that length.

Statistics 1   Solution Bank   Pearson

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

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

$$P_{34} = 1086.7$$

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

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

$$P_{66} = 1168.57$$

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: $\dfrac{5}{100} \times 60 = 3$

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

$$P_5 = 15.7$$

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

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

$$P_{95} = 21.9$$

5% to 95% interpercentile range = 21.9 – 15.7 = 6.2

b 57 − 3 = 54
So 54 data values

4 a Placing the temperatures in order gives:

9.4   10.3   10.3   10.6   10.9   12.1   12.4   12.7   13.2   14.3

$$\text{Median position} = \frac{n+1}{2}$$
$$= \frac{10+1}{2}$$
$$= 5.5$$

The median lies at the midpoint of 10.9 and 12.1.

$$\frac{10.9+12.1}{2} = 11.5$$

Therefore the median is 11.5°C.

The lower quartile position is found using:

$$Q_1 = \frac{n}{4}$$
$$= \frac{10}{4}$$
$$= 2.5$$

Round 2.5 up to 3, therefore Q_1 lies at 10.3.

The upper quartile position is found using:

$$Q_3 = \frac{3n}{4}$$
$$= \frac{3(10)}{4}$$
$$= 7.5$$

Round up to 8, therefore Q_3 lies at 12.7.

$$\text{IQR} = Q_3 - Q_1$$
$$= 12.7 - 10.3$$
$$= 2.4°C$$

b On average, the temperature was higher in June than in May (higher median). The temperature was more variable in May than June (higher IQR).

c The 10th to 90th percentile represents 80% of the data, therefore
$31 \times 0.8 = 24.8$
Therefore 25 days (to the nearest day).