2 Twenty children were asked to estimate the height of a particular tree. Their estimates, in metres, were as follows.

4.1	4.2	4.4	4.5	4.6	4.8	5.0	5.2	5.3	5.4
5.5	5.8	6.0	6.2	6.3	6.4	6.6	6.8	6.9	19.4

(a) Find the mean of the estimated heights. [1]

$$\bar{x} = \frac{\Sigma x}{n}$$

$$= \frac{123.4}{20}$$

$$= \underline{6.17\text{ m}}$$

(b) Find the median of the estimated heights. [1]

$$\frac{5.4 + 5.5}{2} = \underline{5.45\text{ m}}$$

(c) Give a reason why the median is likely to be more suitable than the mean as a measure of the central tendency for this information. [1]

The data contains an outlier: 19.4, which affects the mean, but not the median.

3 A sports club has a volleyball team and a hockey team. The heights of the 6 members of the volleyball team are summarised by $\Sigma x = 1050$ and $\Sigma x^2 = 193\,700$, where x is the height of a member in cm. The heights of the 11 members of the hockey team are summarised by $\Sigma y = 1991$ and $\Sigma y^2 = 366\,400$, where y is the height of a member in cm.

(a) Find the mean height of all 17 members of the club. [2]

$$\text{mean} = \frac{\Sigma x + \Sigma y}{n_x + n_y}$$

$$= \frac{1050 + 1991}{6 + 11}$$

$$= \frac{3041}{17}$$

$$= 178.9 \text{ cm}$$

store

(b) Find the standard deviation of the heights of all 17 members of the club. [3]

$$\sigma = \sqrt{\frac{\Sigma x^2 + \Sigma y^2}{n_x + n_y} - (\text{mean})^2}$$

$$= \sqrt{\frac{193\,700 + 366\,400}{6 + 11} - (178.9)^2}$$

unrounded

$$= \sqrt{\frac{560\,100}{17} - (178.9)^2}$$

$$= 30.8$$

1 For n values of the variable x, it is given that

$$\Sigma(x-50) = 144 \quad \text{and} \quad \Sigma x = 944. \; 1$$

Find the value of n. [3]

$\Sigma(x-50) = 144$

$\Sigma x = 144 + 50n$ 2

1 = 2

$144 + 50n = 944$

$50n = 800$

$n = 16$

1 For n values of the variable x, it is given that

$$\Sigma(x - 200) = 446 \quad \text{and} \quad \Sigma x = 6846. \quad (1)$$

Find the value of n. [3]

$$\Sigma(x - 200) = 446$$

$$\Sigma x = 446 + 200n \quad (2)$$

$$(1) = (2)$$

$$446 + 200n = 6846$$

$$200n = 6400$$

$$n = 32$$

1 50 values of the variable x are summarised by

$$\Sigma(x-20) = 35 \qquad \text{and} \qquad \Sigma x^2 = 25\,036.$$

Find the variance of these 50 values. [3]

$\Sigma x = 35 + 50 \times 20$

$= 1035$

$\bar{x} = \dfrac{\Sigma x}{n}$

$= \dfrac{1035}{50}$

$= 20.7$

Variance $= \dfrac{\Sigma x^2}{n} - \bar{x}^2$

$= \dfrac{25\,036}{50} - (20.7)^2$

$= \underline{72.73}$

2 A summary of 40 values of x gives the following information:

$$\Sigma(x-k) = 520, \qquad \Sigma(x-k)^2 = 9640,$$

where k is a constant.

(a) Given that the mean of these 40 values of x is 34, find the value of k. [2]

$\Sigma(x-k) = 520$

$\Sigma x = 520 + 40k$ ①

$\bar{x} = \dfrac{\Sigma x}{n}$

$34 = \dfrac{\Sigma x}{40}$

$\Sigma x = 1360$ ②

① = ②:

$520 + 40k = 1360$

$40k = 840$

$k = 21$

(b) Find the variance of these 40 values of x. [2]

Variance of $x-k$ = Variance of x

$\text{Variance} = \dfrac{\Sigma(x-k)^2}{n} - \left(\dfrac{\Sigma(x-k)}{n}\right)^2$

mean of $x-k$

$= \dfrac{9640}{40} - \left(\dfrac{520}{40}\right)^2$

$= 72$

1 A summary of 50 values of x gives

$$\Sigma(x-q) = 700, \qquad \Sigma(x-q)^2 = 14\,235,$$

where q is a constant.

(a) Find the standard deviation of these values of x. [2]

Standard deviation of $x - q$ = Standard deviation of x

$$\text{S.d.} = \sqrt{\frac{\Sigma(x-q)^2}{n} - \left(\frac{\Sigma(x-q)}{n}\right)^2}$$

← mean of $x - q$

$$= \sqrt{\frac{14\,235}{50} - \left(\frac{700}{50}\right)^2}$$

$$= \sqrt{284.7 - 14^2}$$

$$= 9.42$$

(b) Given that $\Sigma x = 2865$, find the value of q. [2]

1

$$\Sigma(x-q) = 700$$

$$\Sigma x = 700 + 50q \quad 2$$

1 = 2

$$700 + 50q = 2865$$

$$50q = 2165$$

$$q = 43.3$$