Exercise 2F

1 a Mean $= \frac{24}{8} = 3$

b Variance $= \frac{78}{8} - 3^2 = 0.75$

c Standard deviation $= \sqrt{0.75} = 0.866$

2 Standard deviation $= \sqrt{\frac{5905}{10} - \left(\frac{241}{10}\right)^2} = 3.11$ kg

3 a $\sum h = 165 + 170 + 190 + 180 + 175 + 185 + 176 + 184 = 1425$

Mean $= \frac{1425}{8} = 178.125 \approx 178$

b $\sum h = 1425$ $\sum \frac{h}{n} = 178.125$, $\sum \frac{h^2}{n} \approx 31788$, $\left(\sum \frac{h}{n}\right)^2 \approx 31729$

Variance ≈ 60

c Standard deviation $= \sqrt{59.9} = 7.74$

4 $\sum x = 50 + 86 = 136$

$\sum x^2 = 310 + 568 = 878$

Mean $= \frac{136}{25} = 5.44$

Standard deviation $= \sqrt{\frac{878}{25} - \left(\frac{136}{25}\right)^2} = 2.35$

5 a Mean $= \frac{869}{85} = 10.22$ Omani Riyals

Standard deviation $= \sqrt{\frac{9039}{85} - \left(\frac{869}{85}\right)^2} = 1.35$ Omani Riyals

b $10.22 + 1.35 = 11.57$ Omani Riyals

$\frac{11.57 - 11.50}{12.50 - 11.50} = \frac{s - 65}{85 - 65}$

$s = 66.4$

$85 - 66.4 = 18.6$

So 19 students

6 Standard deviation $= \sqrt{\frac{203}{54} - \left(\frac{81}{54}\right)^2} = 1.23$

7 Mean $= \frac{805}{50} = 16.1$ hours

Standard deviation $= \sqrt{\frac{14\,062.5}{50} - \left(\frac{805}{50}\right)^2} = 4.69$ hours

One standard deviation below mean $= 16.1 - 4.69 = 11.41$ hours.

$$\frac{11.41-10}{15-10} = \frac{p-5}{19-5}$$

$p = 8.948$

$50 - p = 41.052$

41 parts tested (82%) lasted longer than one standard deviation below the mean.

According to the manufacturers, this should be 45 parts (90%), so the claim is false.

8 a Mean $= \frac{243}{30} = 8.1$ kn

Standard deviation $= \sqrt{\frac{2317}{30} - \left(\frac{243}{30}\right)^2} = 3.41$ kn

b $8.1 + 3.41 = 11.51$ kn

$$\frac{11.51-4}{17-4} = \frac{d-0}{30-0}$$

$d = 17.33$

$30 - d = 12.67$

So 12 days

c The windspeeds are equally distributed throughout the range.

Challenge

Mean of the number of loaves sold is 0.787.
Each loaf cost \$1.04.
Therefore the mean amount spent on loaves is:
$0.787 \times 1.04 = 0.818\ldots$
$= 81.8$ cents (3 s.f.)

The standard deviation of the number of loaves is 0.99.
Each loaf cost \$1.04.
Therefore the standard deviation of the amount spent on loaves is:
$0.99 \times 1.04 = 1.0296$
$= \$1.03$ (3 s.f.)