Measures of location and spread 2E

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 Variance $= \frac{254307}{8} - 178.125^2 = 59.9$

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 $= \frac{869}{85} = 10.22$

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

b 10.22 + 1.35 = £11.57

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

s = 66.4

85 − 66.4 = 18.6
So 19 students

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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 = $\sqrt{\frac{14062.5}{50} - \left(\frac{805}{50}\right)^2}$ = 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.

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