

3. Dian uses the large data set to investigate the Daily Total Rainfall,  $r$  mm, for Camborne.

(a) Write down how a value of  $0 < r \leq 0.05$  is recorded in the large data set.

(a) "tr", meaning trace (1 mark)

Dian uses the data for the 31 days of August 2015 for Camborne and calculates the following statistics

$$n = 31$$

$$\sum r = 174.9$$

$$\sum r^2 = 3523.283$$

(b)(i)  
mean,  $\mu = \frac{174.9}{31}$

$= 5.6419... \text{ mm}$   
(1 mark)

(b) Use these statistics to calculate

(i) the mean of the Daily Total Rainfall in Camborne for August 2015,

(ii) the standard deviation of the Daily Total Rainfall in Camborne for August 2015.

(3)

Dian believes that the mean Daily Total Rainfall in August is less in the South of the UK than in the North of the UK.

The mean Daily Total Rainfall in Leuchars for August 2015 is 1.72 mm to 2 decimal places.

(c) State, giving a reason, whether this provides evidence to support Dian's belief.

(2)

Dian uses the large data set to estimate the proportion of days with no rain in Camborne for 1987 to be 0.27 to 2 decimal places.

(d) Explain why the distribution  $B(14, 0.27)$  might **not** be a reasonable model for the number of days without rain for a 14-day summer event.

(1)

(b)(ii) Variance = mean of squares - square of mean  
 $= \frac{3523.283}{31} - \frac{5.6419...^2}{\text{from (b)(i)}} = 81.82...$

Standard Deviation,  $\sigma = \sqrt{\text{Variance}} = \sqrt{81.82...} = 9.045... = 9.05 \text{ mm}$  3sf (2 marks)

(c) Leuchars is in the North with  $\mu_L = 1.72$   
Camborne is in the South with  $\mu_C = 5.64$  From (b)(i) (1 mark)

$\mu_L < \mu_C$ , so there is no evidence to support Dian's belief.  
(1 mark)

(d) An assumption of Binomial Distribution is that each trial is independent with constant  $p$ . However, sunny days are more likely to be followed by sunny days, and rainy days by rainy days, so  $p = 0.27$  is unlikely to be constant for 14 consecutive days. (1 mark)