1. (a)	Accept 990 to 1030 inclusive	B1 **(1)**	1.1b
(b)	Any range between 10 and 50 inclusive	B1 **(1)**	1.1b
		(2 marks)	

	Notes
(a)	B1 (Median pressures usually around 1000~1020) [LDS mark]
(b)	B1 Any answer in this range [LDS mark] Allow answers in the form $a \sim b$ where $\lvert b-a \rvert$ is between 10 and 50 Also allow the case where <u>both</u> a and b are in [10, 50]

Question	Scheme	Marks	AOs
2(a)	No (correlation)/weak (correlation)	B1	1.1b
		(1)	
(b)	(Negative correlation…) As p(ressure) increases, t(emperature) decreases.	B1	2.2b
		(1)	
(c)	990 to 1040 (hPa)	B1	3.4 LDS
		(1)	
(d)	Daily mean wind speed (Beaufort) is a qualitative variable.	B1	2.4 LDS
		(1)	
			(4 marks)

Notes	
(a)	**B1:** correct description of correlation (oe) (ignore reference to positive/negative) condone neutral
(b)	**B1:** correct inference, allow equivalent statements. Negative correlation on its own is B0. Inversely proportional on its own is B0.
(c)	**B1:** an answer in the range 990 to 1040 inclusive (ignore units)
(d)	**B1:** correct explanation that in the LDS, wind speed (Beaufort) is qualitative/not quantitative Allow e.g. 'categorical', e.g. 'given in words', e.g. 'wind speed is (always) light' Do not allow 'not continuous' on its own.

Qu 3	Scheme	Marks	AO
(a)	Hectopascal <u>or</u> hPa	B1 **(1)**	1.2
(b)	$\bar{x} = \bar{y} + 1010$ <u>or</u> $\frac{214}{30} + 1010$	M1	1.1b
	= 1017.1333… awrt **<u>1017</u>**	A1 **(2)**	1.1b
(c)	$\sigma_x = \sigma_y$ (or statement that standard deviation is not affected by this type of coding)	M1	3.1b
	$\left[\sigma_y =\right] \sqrt{\frac{5912}{30} - \left("7.13[33...]"\right)^2}$ <u>or</u> $\sqrt{146.1822...}$	M1	1.1b
	= 12.0905… awrt **<u>12.1</u>**	A1 **(3)**	1.1b
(d)	High pressure (since approx. mean + sd) so clockwise Locations are (from North to South): Leuchars, Heathrow, Hurn	B1	2.4
	Wind direction is direction wind blows <u>from</u> So: Heathrow (**NE**) Hurn (**E**) Leuchars (**W**)	B1 **(2)**	2.2a
		(8 marks)	

	Notes
FYI	1 hPa = 100 Pa; 10hPa = 1 kPa; 1Pa = 1 Nm^{-2}
(a)	B1 for "hectopascal" <u>or</u> hPa (condone pascals, allow millibars <u>or</u> mb) o.e. Do NOT allow kPa <u>or</u> kilopascals <u>or</u> Pa on its own
(b)	M1 for a strategy to find $\bar{x}$ Allow an attempt to find $\sum x$ that gets as far as $\sum x = \sum y - 30 \times 1010$ [= 30 514] A1 for awrt 1017 (accept 1020) [Ignore incorrect units]
(c)	1st M1 for an overall strategy using the fact $\sigma_x = \sigma_y$ (can be implied by correct <u>final</u> ans) <u>or</u> for $\sum x = 30\,514$ and $\sum x^2 = 31\,041\,192$ (both seen and correct) 2nd M1 for a correct expression (with $\sqrt{}$)(ft their $\bar{y}$ to 3sf) allow awrt 146 for 146.1822.. <u>or</u> for correct expression in x can ft their $\sum x > 30\,000$ or their answer to (b) A1 (dep on 2nd M1) for awrt 12.1 [Ignore incorrect units]
Final answer	Final ans of awrt 12.1 scores 3/3 **but** if they then adjust for x e.g. add 1010 (M0M1A1)
(d)	1st B1 for at least one of these reasons (these 2 lines) clearly stated (may see diagram) Need "high pressure" **and** "clockwise" to score on 1st line Contradictory statements B0 e.g. correct N~S list but say "anticlockwise" 2nd B1 (indep of 1st B1) for deducing the 3 correct directions either in the table or stated as above If the answers in table and text are different we take the table (as question says)

Question	Scheme	Marks	AOs
4(a)	tr	B1	1.2
		(1)	
(b)(i)	$\mu = \frac{174.9}{31} = 5.6419\ldots$ awrt 5.64	B1	1.1b
(ii)	$\sigma_r = \sqrt{\frac{3523.283}{31} - \mu^2}$	M1	1.1b
	$= 9.04559\ldots$ awrt 9.05	A1	1.1b
		(3)	
(c)	Leuchars is in the North and Camborne is in the South	M1	2.4
	The mean is smaller for Leuchars than Camborne therefore there is no evidence that Dian's belief is true	A1ft	2.2b
		(2)	
(d)	eg $p = 0.27$ is unlikely to be constant.	B1	2.4
		(1)	
			(7 marks)

Notes:

(a)	**B1**	Allow Tr or trace or Trace
(b)(i)	**B1**	For a correct mean awrt 5.64
(ii)	**M1**	For a correct expression for sd including the $\sqrt{}$ Ft their mean
	A1	awrt 9.05 (Allow $s = 9.1932\ldots$ awrt 9.19) NB awrt to 9.05 or 9.19 with no working is M1 A1
(c)	**M1**	For stating Leuchars is North of Camborne oe eg Camborne is further south
	A1ft	M1 must be awarded. A correct conclusion **and** correct comment about the means ft their mean in (b) Allow No
	SC	for No **and** there are only 2 places used so there is insufficient data. Mark as M0A1 on epen
(d)	**B1**	A correct reason referring to • independence (needs context as to what is independent) eg consecutive 14 days unlikely to be independent. • probability [of rain] not being constant. • Allow a comment that conveys the idea that the proportion of days with no rain will be different over the year.

Qu 5	Scheme	Marks	AO
(a)	Need to replace tr with a numerical value Value of tr is between 0 and 0.05 suggest using e.g 0.025 , 0 or value „ 0.05	M1 A1 **(2)**	1.2 1.1b
(b)(i)	$\left[\bar{x} = \frac{389.3 \sim 390.8}{184}\right] = 2.119\ldots$ awrt **2.12** allow $\frac{195}{92}$ or $2\frac{11}{92}$	B1	1.1b
(ii)	$[\sigma =]\sqrt{\frac{(\text{awrt})4336}{184} - "\bar{x}^2"}$ or allow $[\sigma^2 =]\frac{(\text{awrt})4336}{184} - "\bar{x}^2"$ or awrt 19.1 $= 4.367\ldots$ awrt **4.37**	M1 A1 **(3)**	1.1b 1.1b
(c)(i)	Only covers May~Oct (so not a suitable sample)	B1	1.1b
(ii)	e.g. Winter months are missing when we'd expect more rain so expect estimate in (b)(i) to be an underestimate (oe)	B1 **(2)**	2.4
		(7 marks)	

Notes

(a) M1 for recognising that tr must be replaced (oe) with a numerical value
The following examples would score M0: The tr values are worth 0 so ignore (not replacing) or must remove outliers or fill gaps in table or make widths the same or need to find mid-points
A1 for using a suitable value: e.g. 0.025 (or allow 0) i.e. any value in [0, 0.05]
(these give $\sum x = 390$ (3sf), use of 0.05 gives 390.8, use of 0 gives 389.3 allow in (b)(i))

(b)(i) B1 for awrt 2.12 or allow simplified fraction or mixed number. B0 for $\frac{390}{184}$

(ii) M1 for a correct expression for standard deviation **or** variance. Allow $\sum x^2$ = awrt 4336
Ignore their label σ or σ^2 Can ft their mean

A1 for awrt 4.37 [Use of *s* gives 4.3791… so for correct use seen allow awrt 4.38]

SC **Using *n* = 155** Allow M1 for expression $[\sigma =]\sqrt{\frac{(\text{awrt})4336}{155} - "\bar{x}^2"} = \sqrt{21.64...}$ or 4.65…

Part (c) can effectively be marked together.

(c)(i) B1 for a comment mentioning that data is just from May~Oct (so not representative of the whole year).
Just saying "only 184 days so not representative" is B0, **must mention May ~ Oct**

(ii) B1 for comment that missing/winter months expected to have more rain (oe) **and** "underestimate"(oe)
We are looking for all 3 of these ideas here:
1. A statement or implication that missing data is from winter or different months.
2. A suggestion about the rainfall in these months (probably more rain).
3. A statement about the impact on the estimate in (b)(i) equivalent to saying it would be an underestimate or the (actual) mean will be higher.

SC If you see "Leeming or N or NE has less rain in winter months" – please send to review