Question	Scheme	Marks	AOs
4(a)	Opportunity or convenience sampling	B1	1.1b
		(1)	
(b)	Rainfall on consecutive days may not be **independent**	B1	2.3
		(1)	
(c)	trace or less than 0.05 (mm)	B1	1.2
	e.g. Use 0 (mm)	M1	1.1b
	e.g. Would underestimate mean value as $0 < \text{tr} < 0.05$	A1	2.4
		(3)	
(d)	$\frac{7\times0+10\times0.5+2\times2+7\times5+4\times11}{30}$	**M1**	1.1b
	$=\frac{88}{30}=2.933...$ awrt 2.93	**A1**	1.1b
		(2)	
(e)	$\sum x^2 = 10\times0.5^2+2\times2^2+7\times5^2+4\times11^2 \ (=669.5)$	**M1**	1.1b
	$S_{xx}='669.5'-\frac{'88'^2}{30}=411.366...$ awrt 411.4*	**M1** **A1***	2.1 1.1b
		(3)	
(f)	$\sigma=\sqrt{\frac{411.4}{30}}=3.70...$	**M1**	1.1b
	$\bar{x}-3\sigma=-8.17...$ and $\bar{x}+3\sigma=14.042...$	**A1ft**	3.4
	So possible outliers in the $7<x\leqslant15$ group	**A1ft**	2.2b
		(3)	
			(13 marks)

Notes:

(a)
B1: cao

(b)
B1: must mention independence **in context**, accept suggestion that probability of rainfall at 6 am may not be constant. (again must be **in context**)

(c)
B1: if upper bound given units not required
M1: rounding to 0

A1: underestimate oe

Alternate 1

M1: place tr values in $0 < x \leqslant 1$ class or $0 < x \leqslant ?$ class (as grouped table not yet introduced.)

A1: would give overestimate oe

Alternate 2

M1: use 0.025 mm

A1: little or no impact on mean value.

(d)

M1: use of $\sum fx$ with at least 2 values of x correct

A1: awrt 2.93

(e)

M1: $\sum x^2 = \ldots$ Attempted with at least 2 terms correct may be implied by awrt 670 in working

M1: evidence of correct formula used for S_{xx}

A1*: sight of 411.36… or better

(f)

M1: use of correct formula for σ (accept s = 3.766…)

A1ft: at least one correct limit seen (use of s gives –8.366... and 14.232…) ft on their $\bar{x}$ if between 2 & 4

A1ft: condone no mention of lower limit if no errors seen, ft on their $\bar{x}$ if between 2 & 4