Representations of data - Answers

June 2017 Mathematics Advanced Paper 1: Statistics and Mechanics 1

1.

Question Number	Scheme	Marks
2. (a)	Width $(w) = \underline{\textbf{4}}$ cm	B1
	Areas: 16 cm^2 represents 32 offices (o.e.) <u>or</u> their $h = \dfrac{6}{\text{their } w}$ (3sf) <u>or</u> $\dfrac{8}{3.2} \times 0.6$	M1
	So height $(h) = \underline{\textbf{1.5}}$ cm	A1
		(3)
(b)	e.g. $(45) + \dfrac{20}{25} \times 5$ <u>or</u> $(50) - \dfrac{5}{25} \times 5$ (o.e.) ; $\qquad = (£)\ \underline{\textbf{49}}$	M1; A1
		(2)
(c)	$\dfrac{\sum fy}{90} = \dfrac{4420}{90}$, $\qquad = (£)\ \underline{\textbf{49.11}}$ (or better) (Allow $\dfrac{442}{9}$ or $49\tfrac{1}{9}$)	M1, A1
		(2)
(d)	$\sqrt{\dfrac{226687.5}{90} - \bar{x}^2} = \sqrt{106.8487\ldots}$, $\qquad = 10.3367 \qquad = $ awrt (£) $\underline{\textbf{10.3}}$	M1, A1
		(2)
(e)	Mean $\approx$ median so distribution is symmetric (no skew or very little skew) [Allow mean > median or $k(\bar{x} - Q_2)$ (k>0) so +ve skew if compatible with their figures] [If using quartiles we must see $Q_1 = 44.0$ and $Q_3 = 55.5$ used]	B1ft
		(1)
(f)	Symmetric (or little skew) so <u>normal (or Rika's suggestion) may be suitable</u>	B1ft
		(1)
(g)	$\dfrac{c - 50}{10} = 0.8416$ $\qquad$ [N.B. use of $(1 - 0.8416)$ is B0]	M1, B1
	$c = 58.416 \qquad = (£)\ 58.42 \qquad$ awrt $\underline{\textbf{58.4}}$	A1 (3)
		[14]

		Notes
(a)	M1	for a correct calculation of areas 1 cm^2 = 2 offices (o.e.)
	A1	for $h = 1.5$ cm (Correct answer only 2/2)
(b)	M1	for a correct expression without end point. Allow "$n + 1$" so e.g. $(45)+\frac{20.5}{25}\times 5$
	A1	for 49 or, if $(n + 1)$ used, allow 49.1 (Correct answer of 49 only 2/2)
(c)	M1	for an attempt at $\frac{\sum fy}{90}$ with at least 3 correct products of $\sum fy$ or $4000\le\sum fy \le 5000$
	A1	for 49.11 (Allow 49.1 from correct working) (Correct answer only 2/2, 49.1 only M1A0)
(d)	M1	for a correct expression including $\sqrt{\ }$, ft their mean. Allow use of s
	A1	for awrt 10.3 Allow s = awrt 10.4 if clearly used. [NB use of 49.1 gives 10.389 $\Rightarrow$ A0
		(Correct answer of 10.3 with no working is 2/2)
(e)	B1ft	for reason and "symmetric" (or other correct) statement [Allow positive skew]
		Allow ft of their (b) and their (c). For "symmetric" need $\left|\bar{x}-Q_2\right|<1$ "correlation" is B0
(f)	B1ft	Suggest normal is or isn't suitable **with** suitable reason based on (e) or mean and med
(g)	M1	for stand'ing using "c", 50 and 10 and setting equal to $\pm z$ value where $0.84 \le z \le 0.85$
	B1	for using $z = \pm 0.8416$ or better (calc gives 0.8416212…) in standard' attempt e.g. $\sqrt{10}$ for 10
	A1	for awrt 58.4 (accept 3sf here) (Ans only of awrt 58.4 is M1B0A1 but 58.416 or better is 3/3)