Statistics 1 – Numerical Measures Exam Questions

1 The times, in seconds, taken by 20 people to solve a simple numerical puzzle were

$$17 \quad 19 \quad 22 \quad 26 \quad 28 \quad 31 \quad 34 \quad 36 \quad 38 \quad 39$$
$$41 \quad 42 \quad 43 \quad 47 \quad 50 \quad 51 \quad 53 \quad 55 \quad 57 \quad 58$$

(a) Calculate the mean and the standard deviation of these times. *(3 marks)*

(b) In fact, 23 people solved the puzzle. However, 3 of them failed to solve it within the allotted time of 60 seconds.

Calculate the median and the interquartile range of the times taken by all 23 people. *(4 marks)*

(c) For the times taken by all 23 people, explain why:

(i) the mode is **not** an appropriate numerical measure;

(ii) the range is **not** an appropriate numerical measure. *(2 marks)*

6 On arrival at a business centre, all visitors are required to register at the reception desk. An analysis of the register, for a random sample of 100 days, results in the following information on the number, X, of visitors per day.

Number of visitors per day	Number of days
1 – 10	13
11 – 20	33
21 – 25	17
26 – 30	12
31 – 35	8
36 – 40	5
41 – 50	5
51 – 100	7
Total	**100**

(a) Calculate an estimate of:

(i) μ, the mean number of visitors per day;

(ii) σ, the standard deviation of the number of visitors per day. *(4 marks)*

2 Katrina receives e-mail messages. The table below shows, for a random sample of 40 weekdays, the number of e-mail messages received by Katrina.

Number of e-mail messages	0	1	2	3	4	5	6	7	8
Number of weekdays	2	3	5	6	11	7	3	2	1

Calculate estimates for the mean and the standard deviation of the number of e-mail messages received per weekday by Katrina. *(3 marks)*

3 (a) A sample of people, who commute regularly from a town in Surrey into London, was asked for an estimate of the time taken on their most recent journey. The replies are summarised below.

Time (minutes)	Frequency
35 -	12
45 -	54
55 -	68
65 -	41
85 - 105	23

Calculate estimates of the mean and the standard deviation of these times. *(5 marks)*

(b) A sample of people who commute regularly from a town in Essex into London was also asked for an estimate of the time taken on their most recent journey. Their replies had a mean of 64 minutes and a standard deviation of 21 minutes. Compare, briefly, the journey times estimated by commuters from the two towns. *(2 marks)*

(c) Give **two** reasons why the data presented in parts (a) and (b) may not adequately represent typical commuting times from the two towns. *(2 marks)*

3 When an alarm is raised at a market town's fire station, the fire engine cannot leave until at least five fire-fighters arrive at the station. The call-out time, X minutes, is the time between an alarm being raised and the fire engine leaving the station.

The value of X was recorded on a random sample of 50 occasions. The results are summarised below, where $\bar{x}$ denotes the sample mean.

$$\sum x = 286.5 \qquad \sum (x - \bar{x})^2 = 45.16$$

(a) Find values for the mean and standard deviation of this sample of 50 call-out times. *(2 marks)*

Statistics 1 – Numerical Measures Exam Questions Mark Scheme

1(a)	Mean $(\bar{x})$ = 39.3 to 39.4	B1		AWFW (39.35)
	Standard Deviation (s_n, s_{n-1}) = 12.3 to 12.7	B2	3	AWFW (12.358 or 12.679)
	If **neither** correct **but** working shown, then			$\sum x = 787 \quad \sum x^2 = 34023$
	Mean $(\bar{x}) = \dfrac{\sum x}{20}$	(M1)		Used
(b)	Median = 42	B2		CAO
	Median = 41.5 or 39 or 40	(B1)		CAO
	Interquartile Range = 55 – 31 = 24	B2	4	CAO; allow B1 for identification of 31 and 55; B0 if shown method is incorrect
	Interquartile Range = 21 to 27	(B1)		AWFW
(c)(i)	**Mode:** eg Does not exist If exists, must be > 60 or 58 All / too many different values Sparse data	B1		OE
(ii)	**Range:** eg **Maximum value** is unknown / > 60 or 58	B1	2	OE; accept 'slowest' but not 'smallest'
	Total		9	

6 (a)(i)	Mean $(\bar{x})$ = 24.7 to 25.7	B2		AWFW (25.2)
	Standard Deviation (s_n, s_{n-1}) = 16.7 to 17.7	B2		AWFW (17.1474 or 17.2338)
	MPs (x): 5.5, 15.5, 23, 28, 33, 38, 45.5, 75.5	(B1)		At least 4 correct
	Mean $(\bar{x}) = \dfrac{\sum fx}{100}$	(M1)	4	Use of

2	Mean = 3.75 Standard deviation = 1.84 to 1.87	B1 B2	3	CAO $\quad\quad\quad \sum fx = 150$ AWFW $\quad\quad\quad \sum fx^2 = 698$ $s_{n-1}^2 = 3.47$ to 3.48 and $s_n^2 = 3.38$ to 3.39 Substitution of values into correct formula for variance or SD or SD = 3.38 to 3.48 AWFW $\quad\quad$ M1
	Total		3	

3(a)	Class mid-mark	Frequency			
	40	12	M1		
	50	54			Allow m1A1 for mean and s.d. if method shown.
	60	68			
	75	41			63.2 (63.1 − 63.3)
	95	23			
	$\bar{x} = 63.2$ $s = 15.2$		A2 A2	5	15.2 (15.0 − 15.3)
(b)	Journeys from Surrey have similar duration, on average, but are less variable than those from Essex.		E1 E1	2	
(c)	People asked may not be representative. Times are estimated not measured.		E1 E1	2	Or any other sensible comments e.g. journey time not defined , weather conditions may be extreme etc
		Total		**9**	

3(a)	Mean = $\dfrac{286.5}{50} = 5.73$	B1		CAO
	Standard deviation = $\sqrt{\dfrac{45.16}{49 \text{ or } 50}} =$			
	0.95 to 0.961	B1	2	AWFW