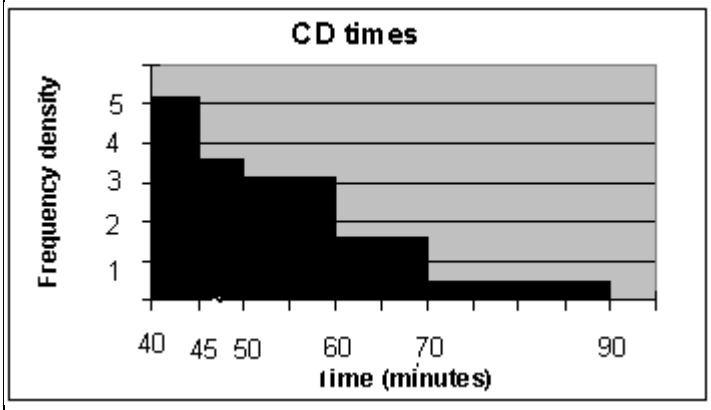
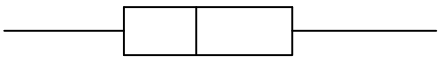
Qn	Answer				Mk	Comment
1	Time	freq	width	freq density		
(i)	40-	26	5	5.2		
	45-	18	5	3.6	M1	Calculation of fd's
	50-	31	10	3.1	A1	(accept values in proportion)
	60-	16	10	1.6		
	70-	9	20	0.45		
					G1 G1 G1	Linear scales Widths of bars Heights of bars
(ii)	e.g. The distribution is positively skewed					
	The mode is at the extreme left of the distribution.				E1	
	Accept range = 50 or median = 52				E1	

2			
(i)	Median distance = 88^{th} value = 480	M1	Within 5
A		A1	cao
B	Lower Quartile = 44^{th} value = 320	B1	
	Upper Quartile = 132^{nd} value = 680	B1	
	Interquartile range = 680 – 320 = 360	M1	ft
(ii)		G1	Basic idea
		G1	Linear 0 - 1200
	0 320 480 680 1200	G1	Box including median (accurate)
(iii)	Distance Frequency		
	$0 < d \leq 200$ 20		
	$200 < d \leq 400$ 44	M1	Correct classes
	$400 < d \leq 600$ 54		Correct
	$600 < d \leq 800$ 32	M1	frequencies
	$800 < d \leq 1000$ 19		
	$1000 < d \leq 1200$ 7		
(iv)	Mid (x) f fx		
	100 20 2000	M1	mid points
	300 44 13200	M1	fx
	500 54 27000		
	700 32 22400		
	900 19 17100		
	1100 7 7700		
	176 89400		
	Estimate of mean = 507.95	A1	
(v)	Mid point of first class now 150	M1	150
	Total increase of 1000		
	New estimate of mean = 513.6	A1	
(vi)	The point (0,0) would move to (100,0)	E1	point (0,0)
		E1	point (100,0)

3	**(i)**		Positive	**[1]**	CAO	
	(ii)		Mean = 5.064 allow 5.1 with working 126.6/25 or 5.06 without SD = 1.324 allow 1.3 with working or 1.32 without	B1 B2 **[3]**	Allow B1 for RMSD = 1.297 or var =1.753 or MSD = 1.683	Also allow B1 for Sxx = 42.08 or for $\Sigma x^2 = 683$ SC1 for both mean = 50.64 and SD = 13.24 (even if over-specified)
	(iii)		$\bar{x} - 2s = 5.064 - 2\times 1.324 = 2.416$ $\bar{x} + 2s = 5.064 + 2\times 1.324 = 7.712$ So there is an outlier.	B1FT M1 A1FT E1 **[4]**	FT their mean and sd for $\bar{x} + 2s$ but withhold final E mark if their limits mean that there are no outliers. For upper limit Incorrect statement such as 7.6 and 8.1 are outliers gets E0 Do not award E1 if calculation error in upper limit	For use of quartiles and IQR $Q_1 = 3.95$; $Q_3 = 6.0$; IQR = 2.05 3.95 – 1.5(2.05) gets M1 Allow other sensible definitions of quartiles 6.0 + 1.5(2.05) gets M1 Limits 0.875 and 9.075 So there are no outliers NB do not penalise over-specification here as not the final answer but just used for comparison. FT from SC1

Question			Answer	Marks	Guidance	
4	(i)		$X \sim B(30, 0.85)$ $P(X = 29) = \binom{30}{29} \times 0.85^{29} \times 0.15^{1} = 30 \times 0.0013466 = 0.0404$	M1 M1 A1 **[3]**	For $0.85^{29} \times 0.15^{1} = 0.0013466$ For $\binom{30}{29} \times p^{29} \times q^{1}$ CAO	 With $p + q = 1$ Allow 0.04 www If further working (EG P(X=29) –P(X=28)) give M2A0
	(ii)		$P(X = 30) = 0.85^{30} = 0.0076$ $P(X \geq 29) = 0.0404 + 0.0076 = 0.0480$	M1 M1 A1 **[3]**	For 0.85^{30} For P(X = 29) + P(X = 30) (not necessar correct, but both attempts at binomial, including coefficient in (i)) CAO	 Allow eg 0.04+0.0076=0.0476 Allow 0.05 with working
	(iii)		Expected number = 10 × 0.0480 = 0.480	M1 A1 **[2]**	For 10 × their **(ii)** FT their **(ii)** but if answer to (ii) leads to a whole number for (iii) give M1A0	**provided (ii) between 0 and 1** Do not allow answer rounded to 0 or 1.