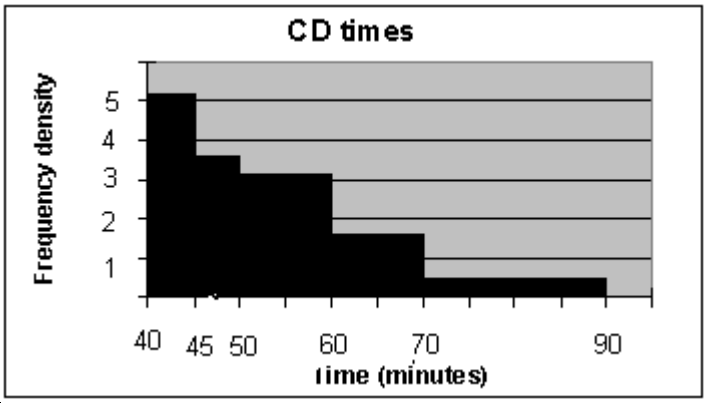
Mark Scheme

Qn	Answer	Mk	Comment
1 (i)	Time freq width freq density 40- 26 5 5.2 45- 18 5 3.6 50- 31 10 3.1 60- 16 10 1.6 70- 9 20 0.45	M1 A1	Calculation of fd's (accept values in proportion)
		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. Accept range = 50 or median = 52	E1 E1	
2 (i)	Mean = 83.95/8 = 10.49	B1	
	Variance = $\dfrac{881.2119 - \frac{83.95^2}{8}}{7}$ = 0.03737	M1	
	Standard deviation = 0.193	A1	
(ii)	2 standard deviations below mean = 10.49 – 2(0.193) = 10.104 but 10.04 < 10.104 so 10.04 is an outlier.	M1 A1	Follow through if divisor n has been used above.
(iii)	This time is much faster than the others. This may be the result of wind assistance, faulty timing, false start and should be discarded. Opposite conclusion such as this could be a genuinely fast time, can also receive full credit.	E1 E1	Appreciating need for investigation Comment in context

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3	Let P(B) = x		
	Using P(AUB) = P(A) + P(B) – P(A ∩ B)	M1	Correct set of equations
	0.9 = 2x + x – 0.3	M1	Correct solution
	x = 0.4		
	P(B) = 0.4	A1	
4	r 0 1 2 3 4		
(i)	P($X = r$) $6k$ $10k$ **$12k$** **$12k$** **$10k$**	B1	1 value correct
		B1	all 3 correct
	$50k = 1 \rightarrow k = 1/50$	M1	sum of 1
(ii)	$E(X) = 110k = 2.2$	M1	sum of rp
		A1	cao
(iii)	$P(X > 2.2) = 22k = 0.44$	B1	
5			
(i)	$\binom{12}{8}$ ways of choosing forwards = 495	M1	
		A1	
(ii)			
	$\binom{12}{8} \times \binom{11}{7}$ ways of choosing team	M1	Product with (i)
		M1	backs
	= 495x330 = 163350	A1	cao
6			
(i)	P(Correct forecast) = $\frac{55+128+81}{365} = \frac{264}{365}$	M1	Numerator
		A1	
(ii)	P(Correct forecast given sunny forecast)		
	$= \frac{55}{75} = 0.733$	M1	Denominator
		A1	
(iii)	P(Correct forecast given wet weather)		
	$= \frac{81}{117} = 0.692$	M1	Denominator
		A1	
(iv)	P(Cloudy weather given correct forecast)		
	$= \frac{128}{264} = 0.485$	M1	Denominator
		A1	
Qn	**Answer**	**Mk**	**Comment**

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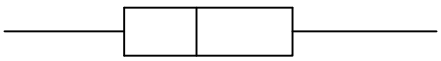
7			
(i)	Median distance = 88th value = 480	M1	Within 5
A		A1	cao
B	Lower Quartile = 44th value = 320	B1	
	Upper Quartile = 132nd value = 680	B1	
	Interquartile range = 680 – 320 = 360	M1	ft
(ii)		G1	Basic idea
		G1	Linear 0 - 1200
	0 320 480 680 1200	G1	Box including median (accurate)
(iii)	Distance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

8	Number not turning up X~B(16,0.2)		
(i)	P(X = 0) = 0.8^{16} = 0.0281	M1 A1	0.8^{16} or tables
(ii)	P(X > 3) = 1 – P($X \leq 3$) or P($X \leq 12$) = 1 – 0.5981 = 0.4019	M1 M1 A1	Manipulation Use of tables
(iii)	X~B(17,0.2) → P($X \geq 1$) = 0.9775 Greater than 0.9 so acceptable	M1 A1 E1	B(17,0.2) 0.9775
(iv)	X~B(18,0.2) → P($X \geq 2$) = 0.9009 Can make 18 appointments X~B(19,0.2) → P($X \geq 3$) = 0.7631	M1 A1 A1 M1	18 and ≥2 0.9009 18 ok 19 and ≥3
(v)	Now X ~ B(20,p) Let p be probability of not turning up. H_0: p = 0.2 H_1: p ≠ 0.2 P($X \leq 1$) = 0.0692 > 2.5% cannot reject H_0 conclude that the proportion of patients not turning up is unchanged.	B1 B1 B1 M1 M1 A1 E1	0.0692 correct comparison cannot reject H_0