Qu. No.	Scheme	Marks
5 (a)	Let T = total time taken	
	$T \sim \text{N}(41+81+57, 5.2^2+4.2^2+6.6^2)$ [So $T \sim \text{N}(179, 88.24)$]	M1 A1
	$\text{P}(T>180) = \text{P}\left(Z > \frac{180-179}{\sqrt{88.24}}\right)$	M1
	$=1-0.5438=0.4562$ (calculator gives 0.4576…) awrt 0.456 to 0.458	M1 A1
		(5)
(b)	Let Y = difference between run and swim or Let $D = R - S - 20$	
	$Y \sim \text{N}(16, 70.6)$ or $D \sim \text{N}(-4, 70.6)$	B1
	$\text{P}(Y>20) = \text{P}\left(Z > \frac{20-16}{\sqrt{70.6}}\right)$ or $\text{P}(D>0) = \text{P}\left(Z > \frac{0-(-4)}{\sqrt{70.6}}\right)$	M1
	$=1-0.6844=0.3156$ (calculator gives 0.3170…) awrt 0.316/0.317	M1 A1
		(4)
(c)	$\text{P}(T>t)=0.95 \Rightarrow \text{P}\left(Z > \frac{t-179}{\sqrt{88.24}}\right)=0.95 \Rightarrow \frac{t-179}{\sqrt{88.24}} = -1.6449$	M1 B1
	$t = 163.548...$ awrt 164	A1
		(3)
(d)	Let X = the number of times greater than 3 hours in 6 attempts	
	$X \sim \text{B}(6, "0.456")$	B1ft
	$\text{P}(X \geqslant 1) = 1 - \text{P}(X=0) = 1 - "0.5438"^6$ $\text{P}(X \geqslant 1) = 1 - \text{P}(X=0) = 1 - "0.5438"^6$	M1
	= 0.9741… (using the calculator value gives 0.9745…) awrt 0.974/0.975	A1
		(3)
(e)	eg The times for each event are not now likely to be independent	M1
	Jane is correct / calculation is not valid	A1 (2)
	Notes	**Total 17**

(a)	**M1**	for setting up a normal distribution with a mean 41 + 81 + 57 (= 179)
	A1	for a correct expression of variance implied by (variance =) 88.24 or for s.d. = awrt 9.39
	M1	for standardising with 180, their mean and their standard deviation
	M1	use of $1-p$ with $0.5 < p < 1$
	A1	awrt 0.456 to 0.458
(b)	**B1**	For $\text{N}(\pm 16, 70.6)$ or $\text{N}(\pm 4, 70.6)$ May be seen in a calculation
	M1	for standardisation with ± 20 or 0, their mean and their s.d.(their var must be > 0) must be compatible e.g. – 20 with –16
	M1	use of $1-p$ with $0.5 < p < 1$
	A1	awrt 0.316/0.317
(c)	**M1**	for standardising using their mean and standard deviation = z value $1 < \lvert z \rvert < 2$
	B1	for correct z value ± 1.6449 or better. Must have compatible sign with standardisation
	A1	awrt 164
(d)	**B1ft**	for writing or using B(6,'0.4562') ft their answer to part (a) to 3sf
	M1	use of $\text{P}(X \geqslant 1) = 1 - \text{P}(X=0)$ [$=1-(1-\textit{their}(a))^6$] allow $\text{P}(X \geqslant 1) = \text{P}(X=1) + \text{P}(X=2) + ... + \text{P}(X=6)$
	A1	awrt 0.974/0.975
(e)	**M1**	Reference to the events no longer being independent (he might get tired after each event or events now follow consecutively)/ calculation does not include time between events
	A1	Correct conclusion (Jane is correct) with corresponding reason