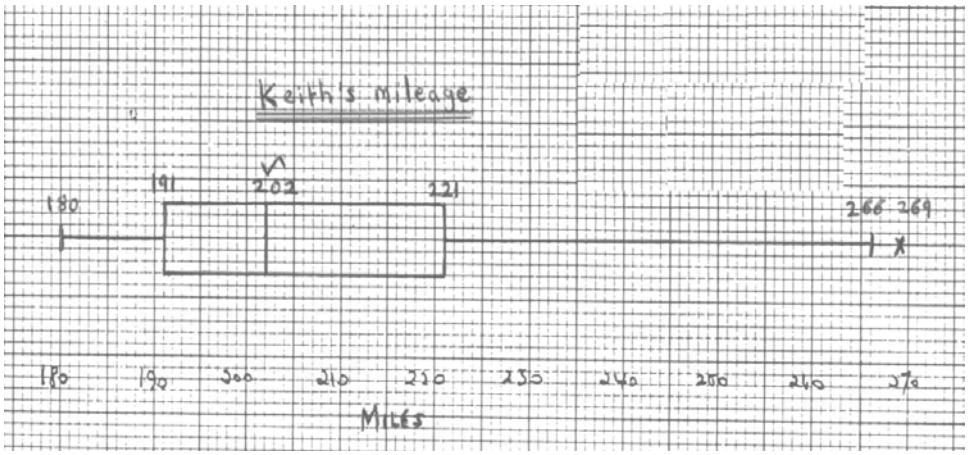
EDEXCEL 6683 STATISTICS S1 NOVEMBER 2004 **MARK SCHEME**

Question number	Scheme	Marks
1 (a)	$a = 202, b = 202, c = 233$	**B1,B1,B1** **(3)**
(b)	$Q_1 - 1.5(Q_3 - Q_1) = 191 - 1.5(221 - 191) = 146$, $Q_3 + 1.5(Q_3 - Q_1) = 221 + 1.5(221 - 191) = 266$	
	attempt at one calculation, 146, 266	**M1A1A1**
	$\Rightarrow$ 269 is an outlier	269 **A1dep**
		
	Scale and 'miles'	**B1**
	Box with two whiskers	**M1**
	191, their median, 221	**A1$\surd$**
	180,266 or 263,269	**A1**
		(8)
(c)	Keith: $Q_2 - Q_1 = 11$, $Q_3 - Q_2 = 19 \Rightarrow$ positive skew one calc,+ve skew	**M1,A1**
	Asif: $Q_2 - Q_1 = 16$, $Q_3 - Q_2 = 15 \Rightarrow$ almost symm or slight –ve skew	**A1**
		(3)
		(Total 14 marks)

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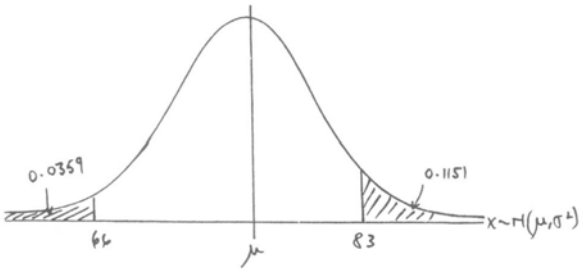
Question number	Scheme	Marks
2(a)	$b = \frac{S_{xy}}{S_{xx}} = \frac{3477.6}{4402} = 0.7900....$ awrt0.79	**B1**
	$a = \bar{y} - b\bar{x} = 28.6 - (0.7900...) \times 36 = 0.159836....$ awrt 0.16	**B1**
	$y = 0.16 + 0.79x$ or equivalent	**B1**$\int$
	81	
(b)	**OR** just answer B1 ONLY	**(3)**
	$y = 0.16 + 0.79 \times 45 = 35.71$ awrt 35.7	**B1**
		(1)
		(Total 4 marks)
3 (a)		
(b)	Bell shaped curve & 4 values	**B1**
		(1)
(i)	$P\left(Z \le \frac{66-\mu}{\sigma}\right) = 0.0359 \Rightarrow 66 - \mu = -1.80\sigma$ -1.80	**B1 seen**
	Clear attempt including standardization either way, or equivalent	**M1,A1**
	$81 - \mu = 1.20\sigma$ 1.20, or equivalent	**B1A1**
	Subtracting $15 = 1.20\sigma + 1.80\sigma \Rightarrow \sigma = 5$ **given answer*	
(ii)	Clear attempt to solve, cso	**M1A1**
	$\mu = 66 + 1.8 \times 5 = 75$ 75	**B1**
		(8)
(c)	$P(69 \le X \le 83) = P\left(\frac{69-75}{5} \le Z \le \frac{83-75}{5}\right)$ standardize both either way	**M1**
	$= P(-1.20 \le Z \le 1.60)$ -1.20, 1.60	**A1 seen**
	$=0.8301$ 4 dp	**A1**
		(3)
		(Total 12 marks)

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Question number	Scheme	Marks
4	x -3 –2 –1 0 1 2 P($X = x$) 0.2 0.2 α α 0.1 0.1	
(a)	$2\alpha + 0.6 = 1 \Rightarrow \alpha = 0.2$ linear function of α =1, 0.2	**M1A1** **(2)**
(b)	P($-1 \leq X < 2$) = P(-1)+P(0)+P(1)=0.5	**B1** **(1)**
(c)	F(0.6)=0.8	**B1** **(1)**
(d)	$E(X) = (-3 \times 0.2) + \ldots\ldots + (2 \times 0.1) = -0.9$ $\sum xP(X = x)$, -0.9 $aE(X) + 3 = 1.2 \Rightarrow a(-0.9) = -1.8$ $aE(X) + 3$ $a = 2$	**M1A1** **M1** **A1** **(4)**
(e)	$E(X^2) = (-3^2 \times 0.2) + \ldots.. + (2^2 \times 0.1) = 3.3$ $\sum x^2P(X = x)$, 3.3 $\text{Var}(X) = 3.3 - (-0.9)^2 = 2.49$ $\sum x^2P(X = x) - (E(X))^2$, 2.49	**M1A1** **M1A1** **(4)**
(f)	$\text{Var}(3X - 2) = 9\text{Var}(X)$ $= 9 \times 2.49 = 22.41$	**M1** **A1** **(2)**
		(Total 14 marks)

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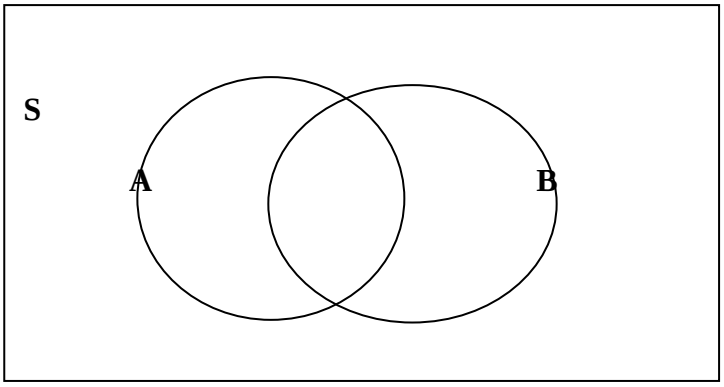
Question number	Scheme	Marks
5 (a)	2 intersecting closed curves in a box **M1**  both $\frac{1}{4}, \frac{1}{12}$ **B1,B1** $\frac{5}{12}$ **B1∫**	**(4)**
(b)	$P(A \cup B) = \frac{7}{12}$ 0.583 or $0.58\dot{3}$ or $\frac{7}{12}$ **B1∫**	**(1)**
(c)	$P(A \mid B) = \frac{P(A \cap B')}{P(B')} = \frac{\frac{1}{4}}{\frac{2}{3}} = \frac{3}{8}$ or 0.375 their fractions divided, cao **M1,A1**	**(2)**
		(Total 7 marks)

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Question number	Scheme	Marks
6 (a)	$S_{xx} = 10164 - \frac{272^2}{8} = 916$	Any one method, cao **M1,A1**
	$S_{yy} = 13464 - \frac{320^2}{8} = 664$	cao **A1**
	$S_{xy} = 11222 - \frac{272 \times 320}{8} = 342$	cao **A1**
	(Or 114.5,83 & 42.75)	
		(4)
(b)	$r = \frac{342}{\sqrt{916 \times 664}} = 0.43852....$	formula, all correct ($\sqrt{608224}$),0.439 **M1A1∫A1**
		(3)
(c)	Slight / weak evidence,	**B1**
	students perform similarly in pressups and situps context for +ve	**B1**
		(2)
(d)	$\bar{x} = \frac{272}{8} = 34$	**M1A1**
	$s = \sqrt{\frac{10164}{8} - 34^2} = \sqrt{114.5} = 10.700...$ method includes $\sqrt{}$, awrt 10.7	**M1A1**
	OR divisor (n-1) awrt 11.4	
		(4)
(e)	$a = 1.96 \times 10.700... = 20.9729...$ (or 22.4 divisor (n-1)) 1.96	**B1**
	$1.96 \times s$,21.0 or 22.4	**M1A1**
		(3)
(f)	Pressups discrete, Normal continuous	**B1**
	Not a very good assumption	**B1 dep**
		(2)
		(Total 18 marks)

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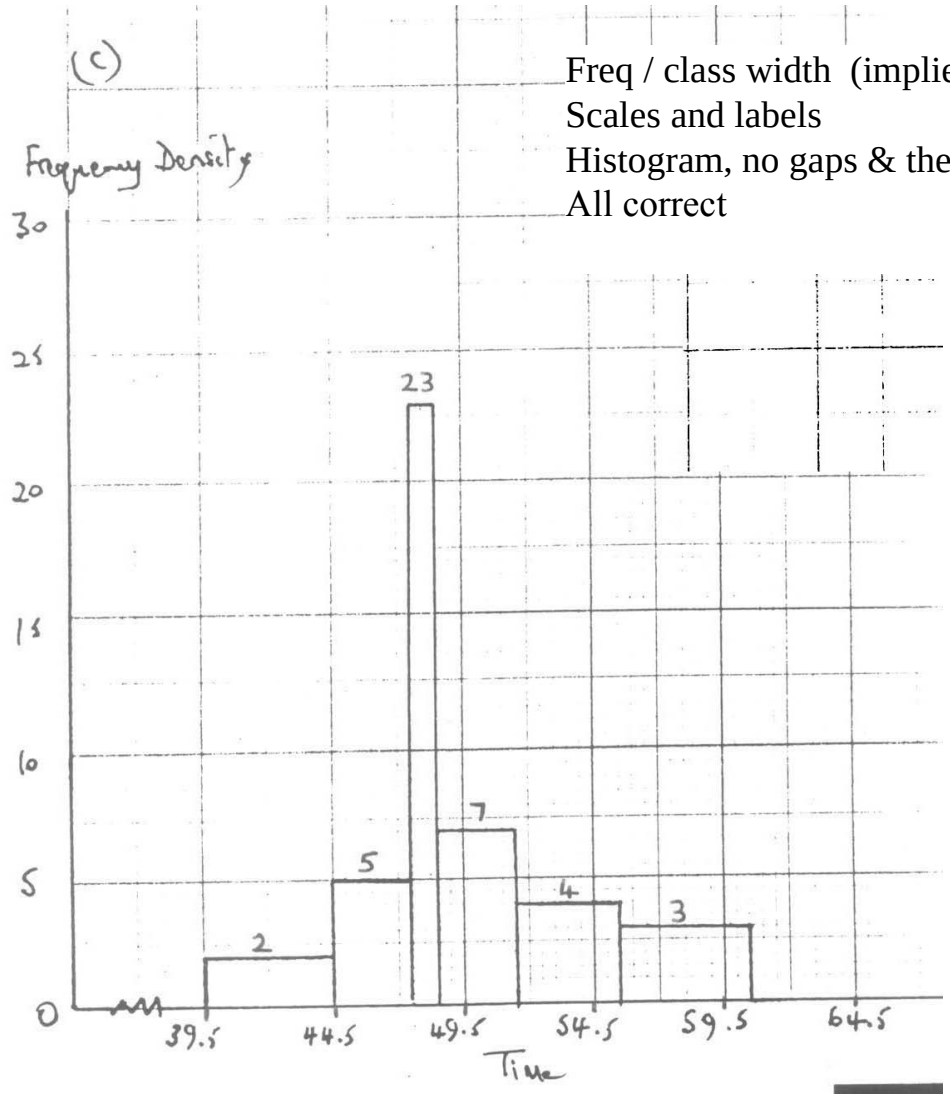
Question number	Scheme	Marks
7(a)	Time data is a continuous variable	**B1** **(1)**
(b)	39.5, 44.5	both **B1** **(1)**
(c)	 Freq / class width (implied) **M1** Scales and labels **B1** Histogram, no gaps & their fd **M1** All correct **A1** **(4)**	
		(Total 6 marks)
		6 mark