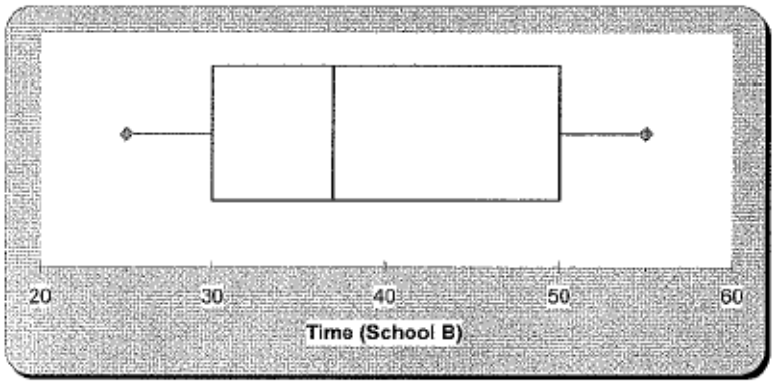
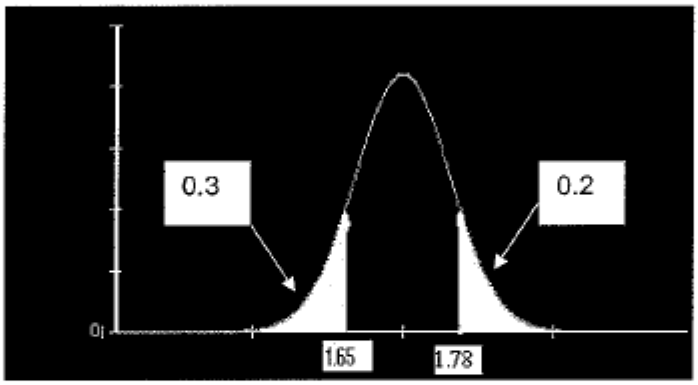
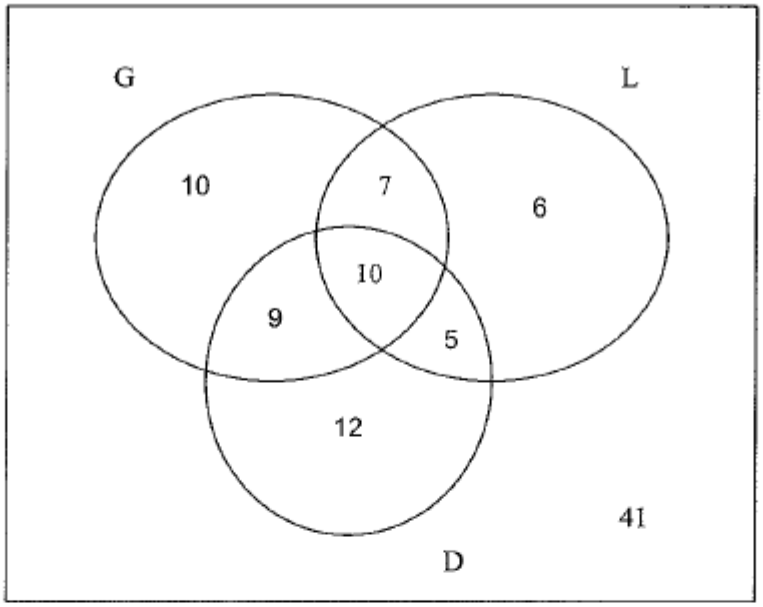
June 2006
6683 Statistics S1
Mark Scheme

Question Number	Scheme	Marks
1(a)	Indicates max / median / min / upper quartile/ lower quartile (2 or more) Indicates outliers (or equivalent description) Illustrates skewness (or equivalent description e.g. shape) Any 3 rows Allows comparisons Indicates range / IQR / spread	**B1** **B1** **B1** **(3)**
(b)(i)	37 (minutes)	**B1**
(ii)	Upper quartile or Q_3 or third quartile or 75^{th} percentile or P_{75}	**B1** **(2)**
(c)	Outlier s How to calculate correctly 'Observations that are very different from the other observations and need to be treated with caution' These two children probably walked / took a lot longer Any 2	 **B1** **B1** **(2)**
(d)	 Box & median & whiskers Sensible scale 30,37,50 25,55	 **M1** **B1** **B1** **B1** **(4)**
(e)	Children from school A generally took less time Any **correct** 4 lines 50% of B ≤ 37 mins, 75% of A < 37 mins (similarly for 30) Median/Q1/Q3 of A < median/Q1/Q3 of B (1 or more) A has outliers, (B does not) Both positive skew IQR of A<IQR of B, range of A>range of B	**B1** **B1** **B1** **B1** **(4)** **Total 15**

Question Number	Scheme		Marks
2. (a)	P(both longer than 24.5)$=\frac{11}{55}\times\frac{10}{54}=\frac{1}{27}$ or $0.\dot{0}\dot{3}\dot{7}$ or 0.037	2 fracs x w/o rep. awrt 0.037	**M1A1**
			(2)
(b)	Estimate of mean time spent on their conversations is		
	$\bar{x}=\frac{1060}{55}=19\frac{3}{11}$ or $19.\dot{2}\dot{7}$ or 19.3	1060/total, awrt 19.3 or 19mins 16s	**M1A1**
			(2)
(c)	$\frac{1060+\sum fy}{80}=21$	21x80=1680	**B1**
	$\sum fy=620$	Subtracting 'their 1060'	**M1**
	$\therefore \bar{y}=\frac{620}{25}=24.8$	Dividing their 620 by 25	**M1A1**
			(4)
(d)	Increase in mean value.		**B1**
	Length of conversations increased considerably during 25 weeks relative to 55 weeks	context - ft only from **comment** above	**B1ʃ**
			(2)
			Total 10
3. (a)	$\sum x=\sum t=337.1,\quad \sum y=16.28$	Can be implied	**B1,B1**
	$S_{xy}=757.467-\frac{337.1\times16.28}{8}=71.4685$	either method, awrt 71.5	**M1A1**
	$S_{xx}=15965.01-\frac{337.1^2}{8}=1760.45875$	awrt 1760	**A1**
			(5)
(b)	$b=\frac{71.4685}{1760.45875}=0.04059652$	/ correct way up, awrt 0.0406	**M1A1**
	$a=\frac{16.28}{8}-b\times\frac{337.1}{8}=0.324364$	using correct formula, awrt 0.324	**M1A1**
	$y=0.324+0.0406x$	3 sf or better but award for copying from above	**A1ʃ**
			(5)
(c)	At $t=40$, $x=40$, $y=1.948$, $l=2461.948$	sub x=40, awrt 1.95, awrt 2461.95	**M1A1A1ʃ**
			(3)
(d)	$l-2460=0.324+0.0406t$	LHS required	**M1**
	$l=2460.324+0.0406t$	awrt 2460.32, f.t. their 0.0406, l and t	**A1**
			(2)
(e)	At $t=90$, $l=2463.978$	awrt 2464	**B1**
			(1)
(f)	90°C outside range of data		**B1**
	unlikely to be reliable		**B1**
			(2)
			Total 18

4 (a)	$E(X)=3;$	**B1**
	$\text{Var}(X)=\frac{25-1}{12}=2$ ****AG****	
	$\text{Var}(X)=1^2\times\frac{1}{5}+2^2\times\frac{1}{5}+3^2\times\frac{1}{5}.....-3^2=11-9=2$ ****AG****	**M1A1**
	Accept (55/5)-9 as minimum evidence.	**(3)**
(b)	$E(3X-2)=3E(X)-2=7$	**M1A1∫**
		(2)
(c)	$\text{Var}(4-3x)=3^2\,\text{Var}(X)=18$	**M1A1**
		(2)
		Total 7
5(a)		
	2 separate sketches OK. Bell Shape	**B1**
	1.78 & 0.2	**B1**
	1.65 & 0.3	**B1**
	Accept **clear** alternatives to 0.3: 0.7/0.5/0.2	**(3)**
(b)	$\frac{1.78-\mu}{\sigma}=0.8416\Rightarrow 1.78-\mu=0.8416\sigma$ either for method	**M1**
	0.8416	**B1**
	$\frac{1.65-\mu}{\sigma}=-0.5244\Rightarrow 1.65-\mu=-0.5244\sigma$ (-)0.5244	**B1**
	N.B. awrt 0.84, 0.52 B1B0	
	Solving gives $\mu=1.70,\sigma=0.095$ awrt 1.7, 0.095 cao	**M1A1A1**
		(6)
(c)	$P(\text{height}\geq 1.74)=1-P(\text{height}<1.74)$ 'one minus'	**M1**
	$=1-P\left(Z<\frac{1.74-1.70}{0.095}\right)$ standardise with their mu and sigma	**M1**
	$=1-P(Z<0.42)=0.3372$ awrt 0.337	**A1**
		(3)
		Total 12

6.(a)



3 closed curves that intersect		**M1**
Subtract at either stage		**M1**
9,7,5		**A1**
10,6,12		**A1**
41 & box		**A1**
		(6)

(b) $P(G,\overline{LH},\overline{D}) = \frac{10}{100} = \frac{1}{10}$ **B1∫**

(1)

(c) $P(\overline{G},\overline{LH},\overline{D}) = \frac{41}{100}$ **B1∫**

(1)

(d) $P(\text{Only two attributes}) = \frac{9+7+5}{100} = \frac{21}{100}$ **M1A1∫**

(2)

(e) $P(G \mid LH\&DH) = \frac{P(G \& LH \& DH)}{P(LH \& DH)} = \frac{\frac{10}{100}}{\frac{15}{100}} = \frac{10}{15} = \frac{2}{3}$ awrt 0.667 **M1A1∫A1**

N.B. Assumption of independence M0

(3)

Total 13