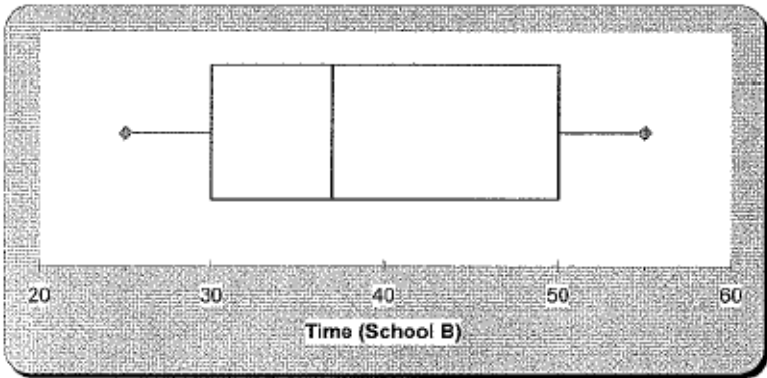
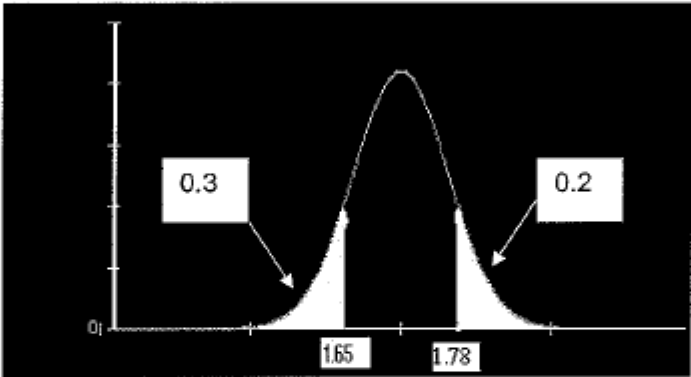


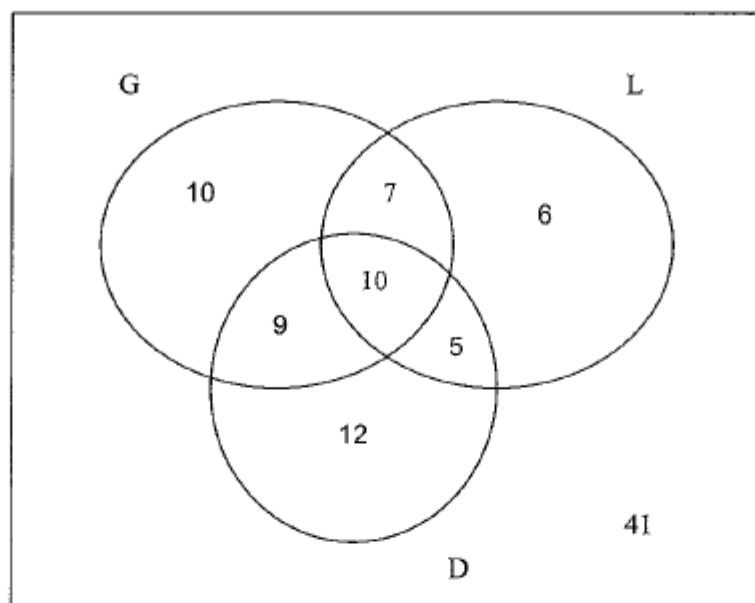
**June 2006
6683 Statistics S1
Mark Scheme**

Question Number	Scheme	Marks
1(a)	<p>Indicates max / median / min / upper quartile/ lower quartile (2 or more)</p> <p>Indicates outliers (or equivalent description)</p> <p>Illustrates skewness (or equivalent description e.g. shape) Any 3 rows</p> <p>Allows comparisons</p> <p>Indicates range / IQR / spread</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>(3)</p>
(b)(i)	37 (minutes)	B1
(ii)	Upper quartile or Q_3 or third quartile or 75 th percentile or P_{75}	B1
(c)	<p>Outlier s</p> <p>How to calculate correctly</p> <p>'Observations that are very different from the other observations and need to be treated with caution'</p> <p>These two children probably walked / took a lot longer</p> <p style="text-align: right;">Any 2</p>	<p>B1</p> <p>B1</p> <p>(2)</p>
(d)	 <p style="text-align: center;">Time (School B)</p> <p>Box & median & whiskers</p> <p>Sensible scale</p> <p>30,37,50</p> <p>25,55</p>	<p>M1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>(4)</p>
(e)	<p>Children from school A generally took less time Any correct 4 lines</p> <p>50% of B \leq 37 mins, 75% of A $<$ 37 mins (similarly for 30)</p> <p>Median/Q_1/Q_3 of A $<$ median/Q_1/Q_3 of B (1 or more)</p> <p>A has outliers, (B does not)</p> <p>Both positive skew</p> <p>IQR of A $<$ IQR of B, range of A $>$ range of B</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>(4)</p>
		Total 15

Question Number	Scheme	Marks
2. (a)	$P(\text{both longer than 24.5}) = \frac{11}{55} \times \frac{10}{54} = \frac{1}{27}$ or $0.\dot{0}3\dot{7}$ 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 $19.\dot{2}7$ or 19.3 1060/total, awrt 19.3 or 19mins 16s	M1A1 (2)
(c)	$\frac{1060 + \sum fy}{80} = 21$ 21x80=1680 $\sum fy = 620$ Subtracting 'their 1060' $\therefore \bar{y} = \frac{620}{25} = 24.8$ Dividing their 620 by 25	B1 M1 M1A1 (4)
(d)	Increase in mean value. Length of conversations increased considerably during 25 weeks relative to 55 weeks context - ft only from comment above	B1 B1 ∫ (2)
		Total 10
3. (a)	$\sum x = \sum t = 337.1, \sum y = 16.28$ Can be implied $S_{xy} = 757.467 - \frac{337.1 \times 16.28}{8} = 71.4685$ either method, awrt 71.5 $S_{xx} = 15965.01 - \frac{337.1^2}{8} = 1760.45875$ awrt 1760	B1,B1 M1A1 A1 (5)
(b)	$b = \frac{71.4685}{1760.45875} = 0.04059652$ / correct way up, awrt 0.0406 $a = \frac{16.28}{8} - b \times \frac{337.1}{8} = 0.324364$ using correct formula, awrt 0.324 $y = 0.324 + 0.0406x$ 3 sf or better but award for copying from above	M1A1 M1A1 A1 ∫ (5)
(c)	At $t = 40, x = 40, y = 1.948, l = 2461.948$ sub $x=40$, awrt 1.95, awrt 2461.95	M1A1A1 ∫ (3)
(d)	$l - 2460 = 0.324 + 0.0406t$ LHS required $l = 2460.324 + 0.0406t$ awrt 2460.32, f.t. their 0.0406, l and t	M1 A1 (2)
(e)	At $t = 90, l = 2463.978$ awrt 2464	B1 (1)
(f)	90° C outside range of data unlikely to be reliable	B1 B1 (2)
		Total 18

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

6.(a)



3 closed curves that intersect
 Subtract at either stage
 9,7,5
 10,6,12
 41 & box

M1
 M1
 A1
 A1
 A1
 (6)

(b)

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

B1f

(1)

(c)

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

B1f

(1)

(d)

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

M1A1f

(2)

(e)

$$P(G|LH \& DH) = \frac{P(G \& LH \& DH)}{P(LH \& DH)} = \frac{\frac{10}{100}}{\frac{15}{100}} = \frac{10}{15} = \frac{2}{3} \quad \text{awrt 0.667}$$

M1A1fA1

(3)

Total 13