EDEXCEL STATISTICS S1 (6683) – JUNE 2003 PROVISIONAL MARK SCHEME

Question Number	Scheme		Marks
1.	Frequency densities: 3.0, 20.0, 9.0, 22.0, 3.0, 3.25	Can be implied from graph	M1 A1
	Graph (see page 2)	Scales and labels	B1
		Bases	B1
		Heights	B1
			(5 marks)

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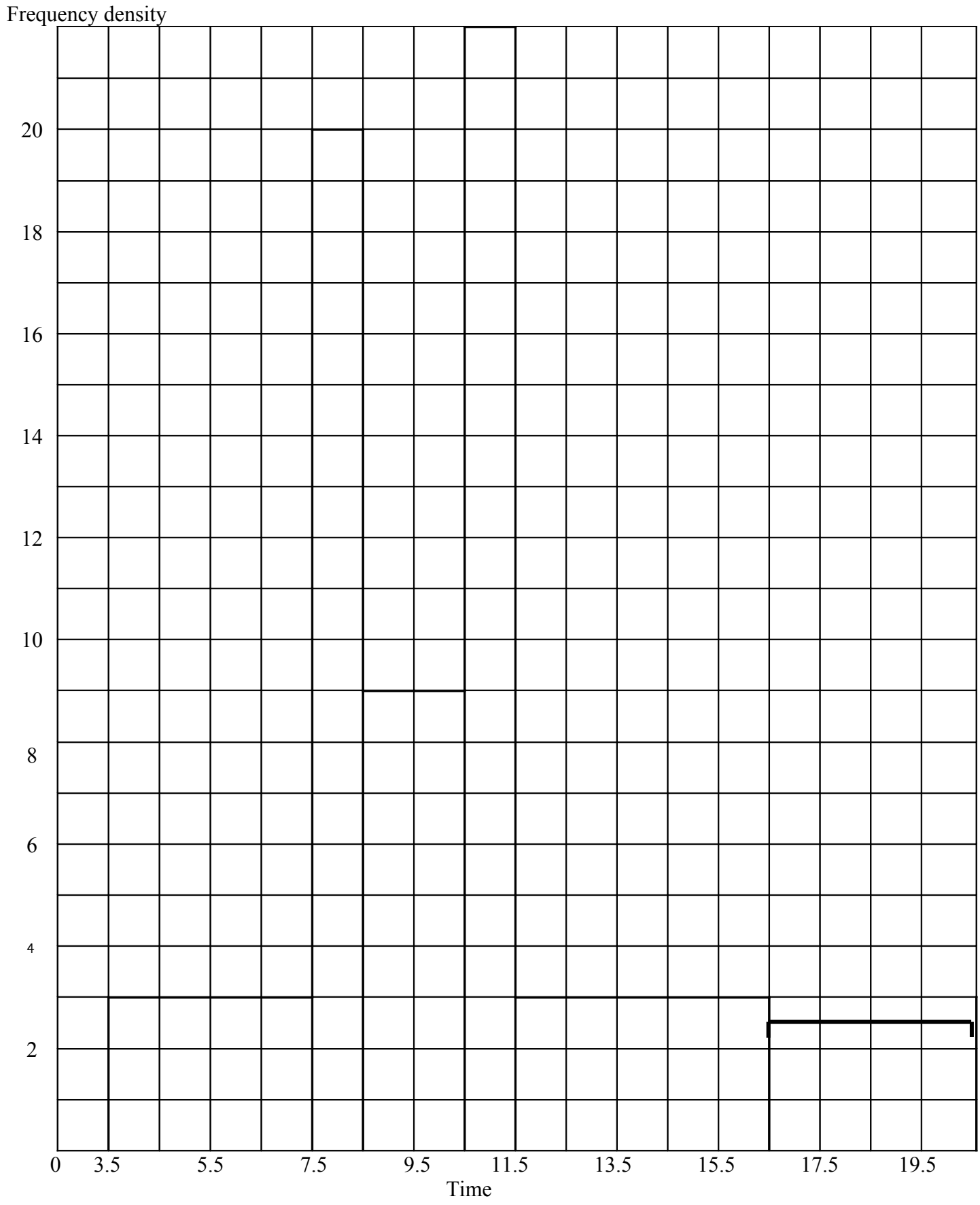
1.



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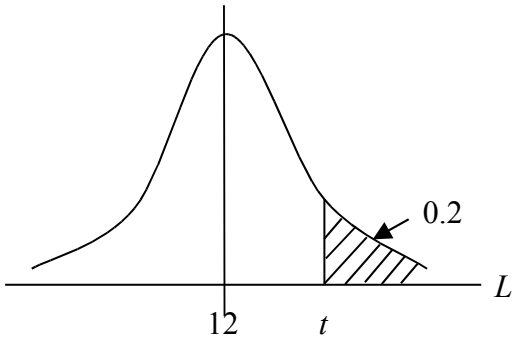
Question Number	Scheme	Marks
2.		
	Let L represent lifetimes $\therefore L \sim N(12, 3^2)$	
	$P(L > t) = 0.2$	M1
	$\therefore \dfrac{t - 12}{3} = 0.8416$	M1 B1 A1
	$\therefore t = 14.5248$	M1 A1 (6)
		(6 marks)
Alt	$P(L > t) = 0.2$	M1
	$\therefore P(L \leq t) = 0.8$	M1
	$\therefore \dfrac{t - 12}{3} = 0.84(16)$	B1 A1
	$\therefore t = 14.52(54)$	M1 A1 (6)
3. (*a*)	$S_{xy} = 204.95 - \dfrac{48.1 \times 52.8}{7} = -157.86142$ (awrt −157.9)	M1 A1
	$S_{xx} = 155.92428$ (awrt 155.9)	A1
	$S_{yy} = 214.95714$ (awrt 215.0)	A1 (4)
(*b*)	$r = \dfrac{-157.86142}{\sqrt{155.92428... \times 214.95714}}$	M1 A1ft
	$= -0.862269$ (awrt −0.862)	A1 (3)
(*c*)(i)	−0.862	B1
(ii)	As sales at on petrol station increases, the other decreases; limited pool of customers; close one garage	B1 (2)
		(9 marks)

(ft = follow through mark; awrt = anything which rounds to)

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4.	(*a*)	$k(16-9)+k(25-9)+k(36-9)=1$	M1 A1
		$\therefore 7k+16k+27k=1 \Rightarrow k=\frac{1}{50}$	A1 (3)
	(*b*)	x: 4, 5, 6 ; P($X=x$): $\frac{7}{50}$, $\frac{16}{50}$, $\frac{27}{50}$	
		$E(X)=(4\times\frac{7}{50})+(5\times\frac{16}{50})+(6\times\frac{27}{50})=\frac{270}{50}=5.4$	M1 A1
		$E(X^2)=(4^2\times\frac{7}{50})+(5^2\times\frac{16}{50})+(6^2\times\frac{27}{50})=\frac{1484}{50}=29.68$	M1 A1
		$\therefore$ Var $(X)=29.68-5.4^2$	M1 A1 (6)
	(*c*)	Var $(2X-3)=2^2$ Var (X)	M1
		$=4\times0.52=2.08$	A1 (2)
			(11 marks)
5.	(*a*)	Discrete uniform	B1 (1)
	(*b*)	P($X=x$) $=\frac{1}{6}$, $x=1, 2, \ldots, 6$	
		$\therefore E(X)=\Sigma x\,P(X=x)=\frac{1}{6}+\frac{2}{6}+\ldots+\frac{6}{6}=\frac{21}{6}=3.5$	B1
		Var $(X)=\Sigma x^2\,P(X=x)-\{E(X)\}^2$	M1
		$=\frac{1}{6}+\frac{4}{6}+\ldots+\frac{36}{6}-(\frac{21}{6})^2=2.91666\ldots$	A1 (3)
	(*c*)	P(three 6s) $=(\frac{1}{6})^3=\frac{1}{216}$	M1 A1 (2)
	(*d*)	$16 \Rightarrow$ (6, 5, 5); (5, 6, 5); (5, 5, 6)	B1 B1
		(6, 6, 4); (6, 4, 6); (4, 6, 6)	B1 B1 (4)
	(*e*)	P(16) $=\frac{6}{216}=\frac{1}{36}$	M1 A1 (2)
			(12 marks)

EDEXCEL STATISTICS S1 (6683) – JUNE 2003 **PROVISIONAL MARK SCHEME**

Question Number		Scheme		Marks
6.	(*a*)	$\bar{x} = \frac{20 + 15 + \ldots + 17}{14} = \frac{312}{14} = 22.2857\ldots$	(awrt 22.3)	M1 A1 (2)
	(*b*)	Bags of crisps 1 | 0 means 10 Totals 0 | 5 (1) 1 | 0 1 3 5 7 (5) 2 | 0 0 5 (3) 3 | 0 1 3 (3) 4 | 0 2 (2)	Label and key 2 corrrect rows All correct	B1 B1 B1 (3)
	(*c*)	$Q_2 = 20$; $Q_1 = 13$; $Q_3 = 31$		B1; B1; B1 (3)
	(*d*)	$1.5 \times \text{IQR} = 1.5 \times (31 - 13) = 27$		B1
		$31 + 27 = 58$; $13 - 27 = -14$	both	M1
		No outliers		A1 (3)
	(*e*)	scale and label		B1
		$Q_1 = 13$, $Q_2 = 20$, $Q_3 = 31$		B1 ft
		Whiskers 5, 42;		B1
	(*f*)	$Q_2 - Q_1 = 7$; $Q_3 - Q_2 = 11$; $Q_3 - Q_2 > Q_2 - Q_1$		M1
		Postive skew		A1 (2)
				(13 marks)

EDEXCEL STATISTICS S1 (6683) – JUNE 2003 PROVISIONAL MARK SCHEME

Question Number		Scheme	Marks
7.	(*a*)	*m* is explanatory variable	B1 (1)
	(*b*)	scales and labels	B1
		points (7, 19), (8, 10), (9, 11), (10, 15), (13, 21), (14, 23), (17, 26), (20, 31)	B2 (3)
	(*c*)	$\Sigma m = 98;\ \Sigma p = 156;\ \Sigma m^2 = 1348;\ \Sigma mp = 2119$	
		$S_{mp} = 2119 - \frac{98 \times 156}{8} = 208$	M1 A1
		$S_{mm} = 1348 - \frac{98^2}{8} = 147.5$	A1
		$\therefore b = \frac{S_{mp}}{S_{mm}} = \frac{208}{147.5} = 1.410169$ (awrt 1.41)	M1 A1
		$a = \frac{156}{8} - (1.410169\ldots) \times \frac{98}{8} = 2.225429$ (awrt 2.23)	M1 A1
		$\therefore p = 2.23 + 1.41m$	A1 ft (8)
	(*d*)	Line on graph	M1 A1 (2)
	(*e*)	$p = 2.23 + 1.41 \times 15 = 23.38$	M1 A1 (2)
			(14 marks)

(ft = follow through mark; −1 eeoo = minus one mark for each error or omission)