GCE

Edexcel GCE

Statistics S1 (6683)

Summer 2005

advancing learning, changing lives

Mark Scheme (Results)

Edexcel GCE
Statistics S1 (6683)

June 2005
6683 Statistics S1
Mark Scheme

Question Number	Scheme	Marks
1.	Diagram A : y & x : r = - 0.79; As x increases, y decreases or most points lie in the 2nd and 4th quadrant.	B1;B1dep
	Diagram B : v & u: r = 0.08; No real pattern. Several values of v for one value of u or points lie in all four quadrants, randomly scattered.	B1;B1dep
	Diagram C : t & s : r = 0.68; As s increases, t increases or most points lie in the 1st and 3rd quadrants	B1;B1dep (6)
2. (a)	Distance is a continuous. continuous	B1 (1)
(b)	F.D = freq/class width $\Rightarrow$ 0.8, 3.8, 5.3, 3.7, 0.75, 0.1 or the same multiple of	M1 A1 (2)
(c)	$Q_2 = 50.5 + \frac{(67-23)}{53}\times 10 = 58.8$ awrt 58.8/58.9	M1 A1
	$Q_1 = 52.48$; $Q_3 = 67.12$ awrt 52.5/52.6 67.1/67.3	A1 A1 (4)
	Special case : no working B1 B1 B1 (≡ A's on the epen)	
(d)	$\bar{x} = \frac{8379.5}{134} = 62.5335...$ awrt 62.5	B1
	$s = \sqrt{\frac{557489.75}{134} - \left(\frac{8379.5}{134}\right)^2}$	M1 A1√
	s = 15.8089…. ($S_{n-1} = 15.86825...$) awrt 15.8 (15.9)	A1 (4)
	Special case : answer only B1 B1 (≡ A's on the epen)	
(e)	$\frac{Q_3 - 2Q_2 + Q_1}{Q_3 - Q_1} = \frac{67.12 - 2\times 58.8 + 52.48}{67.12 - 52.48}$ subst their Q_1,Q_2 &Q_3 need to show working for A1√ and have reasonable values for quartiles	M1 A1√
	$= 0.1366 \Rightarrow$; +ve skew awrt 0.14	A1; B1 (4)
(f)	For +ve skew Mean > Median & 62.53 > 58.80 or $Q_3 - Q_2$ (8.32) > $Q_2 - Q_1$(6.32) Therefore +ve skew	B1 (1)

Question Number	Scheme		Marks
3. (a)	$S_{xy} = 8880 - \frac{130 \times 48}{8} = (8100)$	may be implied	B1
	$S_{xx} = 20487.5$		
	$b = \frac{s_{xy}}{s_{xx}} = \frac{8100}{20487.5} = 0.395363...$	allow use of their S_{xy} for M awrt 0.395	M1 A1
	$a = \frac{48}{8} - (0.395363...)\frac{130}{8} = -0.424649...$	allow use of their b for M awrt -0.425	M1 A1
	$y = -0.425 + 0.395x$	3s.f.	B1 √ (6)
	Special case answer only B0 M0 B1 M0 B1 B1(fully correct 3sf) (≡ to B0 M0 A1 M0 A1 B1 on the epen)		
(b)	$f - 100 = -0.424649... + 0.395...(m - 250)$	subst f - 100 & m - 250	M1 A1√
	$f = 0.735 + 0.395m$	3 s.f.	A1 (3)
(c)	$m = 235 \Rightarrow f = 93.64489....$	awrt 93.6/93.7	B1 (1)

4(a)	$1.5\ (Q_3 - Q_1) = 1.5\ (28 - 12) = 24$	may be implied	B1
	$Q_3 + 24 = 52 \Rightarrow 63$ is an outlier	att Q3 +… or Q1 - …, 52 and -12or <0 or evidence of no lower outliers	M1, A1
	$Q_1 - 24 < 0 \Rightarrow$ no outliers	63 is an outlier	A1
			M1 A1 A1 (7)
(b)	Distribution is +ve skew; $Q_2 - Q_1$ (5) < $Q_3 - Q_2$ (11);		B1; B1 (2)
(c)	Many delays are small so passengers should find these acceptable or sensible comment in the context of the question.		B1 (1)

5.(a)	$k + 2k + 3k + 5k + 6k = 1$	use of $\sum P(X = x) = 1$	M1
	$17k = 1$		
	$k = \frac{1}{17} = 0.0588$		A1 (2)
(b)	$E(X) = 1\times\frac{1}{17} + 2\times\frac{2}{17} + ... + 5\times\frac{6}{17} = \frac{64}{17}$	use of $\sum xP(X = x)$ and at least 2 prob correct	M1
	$= 3\frac{13}{17}$	Do not ignore subsequent working	A1
(c)	$E(X^2) = 1^2\times\frac{1}{17} + 2^2\times\frac{2}{17} + ... + 5^2\times\frac{6}{17} = \left(\frac{266}{17} = 15.6\right)$	use of $\sum x^2P(X = x)$ and at least 2 prob correct	M1 A1
	$\text{Var}(X) = \frac{266}{17} - \left(\frac{64}{17}\right)^2$	use of $\sum x^2 P(X = x)$ - $(E(X))^2$	M1 A1
	$= 1.4740...$	awrt 1.47	(4)
(d)	$\text{Var}(4 - 3X) = 9\,\text{Var}(X) = 9 \times 1.47 = 13.23 \Rightarrow 13.2$ or $9 \times 1.4740... = 13.266 \Rightarrow 13.3$	cao 9 Var X	M1 A1 (2)

6(a) $M \sim N(155, 3.5^2)$

$$P(M > 160) = P\left(z > \frac{160-155}{3.5}\right)$$

standardising $\pm(160-155), \sigma, \sigma^2, \sqrt{\sigma}$ — M1

$$= P(z > 1.43)$$ — A1

$$= 0.0764$$ — A1 (3)

(b) $P(150 \le M \le 157) = P(-1.43 \le z \le 0.57)$ awrt -1.43, 0.57 — B1 B1

$= 0.7157 - (1 - 0.9236)$ p>0.5 — M1

$= 0.6393$ 0.6393 - 0.6400 4dp — A1 (4)

special case : answer only B0 B0 M1 A1

(c) $P(M \le m) = 0.3 \Rightarrow \frac{m-155}{3.5} = -0.5244$ -0.5244 att stand = z value for A1 may use awrt to -0.52. — B1 M1 A1

$m = 153.2$ cao — A1 (4)

7.

	Glasses	No Glasses	Totals
Science	18	**12**	30
Arts	**27**	**23**	**50**
Humanities	44	**24**	68
Totals	89	**59**	148

50 may be seen in (a)
23 may be seen in (b)
B1 B1

(a) $P(\text{Arts}) = \frac{50}{148} = \frac{25}{74} = 0.338$ a number/148 — M1 A1 (4)

(b) $P(\text{No glasses / Arts}) = \frac{23/148}{50/148} = \frac{23}{50} = 0.46$ $\frac{\text{prob}}{\text{their(a)prob}}$ or $\frac{\text{number}}{\text{their } 50}$ — M1 A1 (2)

(c) $P(\text{Right Handed}) = (\frac{30}{148} \times 0.8) + (\frac{50}{148} \times 0.7) + (\frac{68}{148} \times 0.75)$ attempt add three prob — M1 A1 √

A1 √ on their (a)

$= \frac{55}{74} = 0.743$ awrt 0.743 — A1 (3)

(d) $P(\text{Science / Right handed}) = \frac{\frac{30}{148} \times 0.8}{(c)} = \frac{12}{55} = 0.218$ √ on their (c) — M1 A1√ A1 (3)