

Mark Scheme (Results) Summer 2009

GCE

GCE Mathematics (6683/01)



June 2009
6683 Statistics S1
Mark Scheme

Question Number	Scheme	Marks
Q1 (a)	$(S_{pp}) = 38125 - \frac{445^2}{10}$ $= 18322.5$ <p style="text-align: right;">awrt 18300</p> $(S_{pt}) = 26830 - \frac{445 \times 240}{10}$ $= 16150$ <p style="text-align: right;">awrt 16200</p>	<p>M1 A1</p> <p>A1</p> <p style="text-align: right;">(3)</p>
(b)	$r = \frac{"16150"}{\sqrt{"18322.5" \times 21760}}$ $= 0.8088\dots$ <p style="text-align: right;">awrt 0.809</p>	<p>Using their values for method</p> <p>M1</p> <p>A1</p> <p style="text-align: right;">(2)</p>
(c)	As the temperature increases the pressure increases.	<p>B1</p> <p style="text-align: right;">(1)</p> <p style="text-align: right;">[6]</p>
Notes	<p>1(a) M1 for seeing a correct expression $38125 - \frac{445^2}{10}$ or $26830 - \frac{445 \times 240}{10}$</p> <p>If no working seen, at least one answer must be exact to score M1 by implication.</p> <p>1(b) Square root and their values with 21760 all in the right places required for method. Anything which rounds to (awrt) 0.809 for A1.</p> <p>1(c) Require a correct statement in context using <u>temperature/heat</u> and <u>pressure</u> for B1.</p> <p>Don't allow "as t increases p increases".</p> <p>Don't allow proportionality.</p> <p>Positive correlation only is B0 since there is no interpretation.</p>	

Question Number	Scheme	Marks
Q3 (a) (b)	<p>1(cm) cao</p> <p>10 cm² represents 15 10/15 cm² represents 1</p> <p>Therefore frequency of 9 is $\frac{10}{15} \times 9$ or $\frac{9}{1.5}$</p> <p>height = 6(cm)</p> <p style="text-align: right;">or 1cm² represents 1.5</p> <p style="text-align: right;">Require $\times \frac{2}{3}$ or $\div 1.5$</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p style="text-align: right;">[3]</p>
Notes	<p>If 3(a) and 3(b) incorrect, but their (a) x their (b)=6 then award BOM1A0</p> <p>3(b) Alternative method: f/cw=15/6=2.5 represented by 5 so factor x2 award M1 So f/cw=9/3=3 represented by 3x2=6. Award A1.</p>	

Question Number	Scheme	Marks
<p>Q4 (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>$Q_2 = 17 + \left(\frac{60-58}{29}\right) \times 2$ $= 17.1$ (17.2 if use 60.5) awrt 17.1 (or17.2)</p> <p>$\sum fx = 2055.5$ $\sum fx^2 = 36500.25$ Exact answers can be seen below or implied by correct answers. Evidence of attempt to use midpoints with at least one correct</p> <p>Mean = 17.129... awrt 17.1</p> <p>$\sigma = \sqrt{\frac{36500.25}{120} - \left(\frac{2055.5}{120}\right)^2}$ $= 3.28$ (s= 3.294) awrt 3.3</p> <p>$\frac{3(17.129 - 17.1379...)}{3.28} = -0.00802$ Accept 0 or awrt 0.0</p> <p>No skew/ slight skew</p> <p>The skewness is very small. Possible.</p>	<p>M1</p> <p>A1 (2)</p> <p>B1 B1</p> <p>M1</p> <p>B1</p> <p>M1</p> <p>A1 (6)</p> <p>M1 A1</p> <p>B1 (3)</p> <p>B1 B1dep (2) [13]</p>
<p>Notes</p>	<p>4(a) Statement of $17 + \frac{\text{freq into class}}{\text{class freq}} \times cw$ and attempt to sub or</p> <p>$\frac{m-17}{19-17} = \frac{60(.5)-58}{87-58}$ or equivalent award M1</p> <p>cw=2 or 3 required for M1. 17.2 from cw=3 award A0.</p> <p>4(b) Correct $\sum fx$ and $\sum fx^2$ can be seen in working for both B1s Midpoints seen in table and used in calculation award M1 Require complete correct formula including use of square root and attempt to sub for M1. No formula stated then numbers as above or follow from (b) for M1 $(\sum fx)^2, \sum (fx)^2$ or $\sum f^2x$ used instead of $\sum fx^2$ in sd award M0 Correct answers only with no working award 2/2 and 6/6</p> <p>4(c) Sub in their values into given formula for M1</p> <p>4(d) No skew / slight skew / 'Distribution is almost symmetrical' / 'Mean approximately equal to median' or equivalent award first B1. Don't award second B1 if this is not the case. Second statement should imply 'Greg's suggestion that a normal distribution is suitable is possible' for second B1 dep. If B0 awarded for comment in (c).and (d) incorrect, allow follow through from the comment in (c).</p>	

Question Number	Scheme	Marks
Q5 (a)	$b = \frac{59.99}{33.381}$ $= 1.79713\dots$ <p style="text-align: right;">1.8 or awrt 1.80</p> $a = 32.7 - 1.79713\dots \times 51.83$ $= -60.44525\dots$ <p style="text-align: right;">awrt -60</p> $w = -60.445251\dots + 1.79713\dots l$ <p style="text-align: right;"><i>l</i> and <i>w</i> required and awrt 2sf</p>	M1 A1 M1 A1 A1ft (5)
(b)	$w = -60.445251\dots + 1.79713\dots \times 60$ $= 47.3825\dots$ <p style="text-align: right;">In range 47.3 – 47.6 inclusive</p>	M1 A1 (2)
(c)	It is extrapolating so (may be) unreliable.	B1, B1dep (2)
Notes	5(a) Special case $b = \frac{59.99}{120.1} = 0.4995 \text{ M0A0}$ $a = 32.7 - 0.4995 \times 51.83 \text{ M1A1}$ $w = 6.8 + 0.50l \text{ at least 2 sf required for A1}$ 5(b) Substitute into their answer for (a) for M1 5(c) ‘Outside the range on the table’ or equivalent award first B1	[9]

Question Number	Scheme	Marks								
Q6 (a)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px;">0</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> </tr> <tr> <td style="padding: 2px;">$3a$</td> <td style="padding: 2px;">$2a$</td> <td style="padding: 2px;">a</td> <td style="padding: 2px;">b</td> </tr> </table>	0	1	2	3	$3a$	$2a$	a	b	B1 (1)
0	1	2	3							
$3a$	$2a$	a	b							
(b)	$3a + 2a + a + b = 1$ $2a + 2a + 3b = 1.6$ $14a = 1.4$ $a = 0.1$ $b = 0.4$	or equivalent, using Sum of probabilities =1 or equivalent, using $E(X)=1.6$ Attempt to solve cao cao M1 M1 M1dep B1 B1 (5)								
(c)	$P(0.5 < x < 3) = P(1) + P(2)$ $= 0.2 + 0.1$ $= 0.3$	$3a$ or their $2a$ +their a Require $0 < 3a < 1$ to award follow through M1 A1 ft (2)								
(d)	$E(3X - 2) = 3E(X) - 2$ $= 3 \times 1.6 - 2$ $= 2.8$	M1 cao A1 (2)								
(e)	$E(X^2) = 1 \times 0.2 + 4 \times 0.1 + 9 \times 0.4 (= 4.2)$ $\text{Var}(X) = "4.2" - 1.6^2$ $= 1.64$	**given answer** M1 M1 A1 (3)								
(f)	$\text{Var}(3X - 2) = 9 \text{Var}(X)$ $= 14.76$	awrt 14.8 M1 A1 (2)								
Notes		[15]								
<p>6(a) Condone a clearly stated in text but not put in table.</p> <p>6(b) Must be attempting to solve 2 different equations so third M dependent upon first two Ms being awarded. Correct answers seen with no working B1B1 only, 2/5 Correctly verified values can be awarded M1 for correctly verifying sum of probabilities =1, M1 for using $E(X)=1.6$ M0 as no attempt to solve and B1B1 if answers correct.</p> <p>6(d) 2.8 only award M1A1</p> <p>6(e) Award first M for at least two non-zero terms correct. Allow first M for correct expression with a and b e.g. $E(X^2) = 6a+9b$ Given answer so award final A1 for correct solution.</p> <p>6(f) 14.76 only award M1A1</p>										

Question Number	Scheme	Marks
Q7(a) (i)	$P(A \cup B) = a + b$	cao B1
(ii)	$P(A \cup B) = a + b - ab$	B1
(b)	$P(R \cup Q) = 0.15 + 0.35 = 0.5$	0.5 B1
(c)	$P(R \cap Q) = P(R Q) \times P(Q) = 0.1 \times 0.35 = 0.035$	M1 A1 (2)
(d)	$P(R \cup Q) = P(R) + P(Q) - P(R \cap Q) \quad \text{OR} \quad P(R) = P(R \cap Q') + P(R \cap Q)$ $0.5 = P(R) + 0.35 - 0.035$ $P(R) = 0.185$	M1 A1 0.185 (2) [7]
Notes	<p>7(a) (i) Accept $a + b - 0$ for B1</p> <p>Special Case</p> <p>If answers to (i) and (ii) are</p> <p>(i) $P(A)+P(B)$ and (ii) $P(A)+P(B)-P(A)P(B)$</p> <p>award B0B1</p> <p>7(a)(i) and (ii) answers must be clearly labelled or in correct order for marks to be awarded.</p>	

