

**MARK SCHEME for the October/November 2009 question paper
for the guidance of teachers**

4040 STATISTICS
4040/01 Paper 1, maximum raw mark 100

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- 1 (i) (a) 20
- (b) 45 (allow 44–46) B1
- (ii) For three 'whole canoes' and 'something' M1
- For an accurate portrayal of 33 A1
- [4]
- 2 (i) To test whether respondents clearly understand the questions. B1
- To test whether the responses to the questions provide the information required. B1
- (ii) Advantage. Cheap, compared to interviewing costs. B1
- Disadvantage. Likely low response rate. B1
- [4]
- 3 (i) Any appreciation of the need to 'un-cumulate' the figures M1
- Correct values (either ordered or unordered)
- 12 11 11 9 8 14 12 17 17 12 17 A1
- (8 9 11 11 12 12 12 14 17 17 17)
- (ii) Mean = $140/11$ (indication of a correct method) M1
- = 12.7(272...) A1
- Median = 12 (ft provided the M1 in (i) has scored) B1ft
- (iii) Because the data are bi-modal B1
- [6]
- 4 (i) 4 B1
- (ii) (a) 1, 2, 3, 4 (ft 1 up to 'their N') B1ft
- (b) Correct method (can be implied by two correct results) M1

N	P(N)
1	0.4
2	0.3
3	0.2
4	0.1

- Any three correct (with or without others) A1
- All four correct (and no others) A1
- Their values of N and P(N) presented in a suitable table B1
- [6]

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- 5 (i) Both 103s in the correct places
- (ii) Both 13s in the correct places B1
- (iii) 37 correct (ft 'their 103' – 66) B1ft
 39 correct (ft 52 – 'their 13') B1ft
 89 correct (ft 52 + 'their 37') B1ft
 77 correct (ft 166 – 'their 89') B1ft
 30 correct (ft provided both row and column totals tally) B1
- [7]
- 6 (i) Any attempt to use 55 and 440 M1
 $(55/440) \times 1000$ M1
 = 125 (per thousand) A1
- (ii) Management $3/20 \times 1000 \times 0.04 = 6$
 Technical $9/75 \times 1000 \times 0.17 = 20.4$
 Skilled $18/230 \times 1000 \times 0.41 = 32.1$
 Unskilled $25/115 \times 1000 \times 0.38 = 82.6$
- Correct method used in any one category M1*
 One correct value or expression seen A1
 All other correct values or expressions seen A1
 Summing the rates for the four categories dep M1*
 141.10 (per thousand) (AWRT 141.1) A1
- (iii) The category of employment structure in the factory is not the same as in the standard population. B1
- [9]
- 7 (i) (a) Quantitative B1
- (b) Continuous B1
- (ii) Most of the lengths are close to that intended and so the process is quite precise. M1
 A1
- (iii) (a) Median = 5.0074 or 5.0075 B1
- (b) LQ = 5.0055 B1
- (c) 90th percentile = value in the range 5.0105 to 5.0108 inclusive B2
- (iv) Sight of an attempt at the cum. freq. at 5.0084 M1
 26 A1
- (v) cf's 11 and 77 seen or implied B1
 Indication of (higher tolerance limit of minus lower tolerance limit of) M1
 $77 - 11 = 66$ A1ft

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- (vi) (a) Correct method for either measure seen, or implied by a correct result
Median item is $[11 + (66/2)] = 44$ th on graph
5.0077 A1
- (b) LQ item is $[11 + (66/4)] = 27.5$ th on graph
5.0064 A1
- [16]**
- 8 (a) (i) 1 2 3 4 5 7 8 9 10 11 12 B1
- (ii) $1/6$ B1
- (iii) $1/36$ B1
- (iv) Correct probability expression using their answers to (ii) and (iii)
 $1/108$ M1
A1
- (b) P(first) = $1/10$ B1
P(fourth) = $9/10 \times 8/9 \times 7/8 \times 1/7 = 1/10$
P(last) = $9/10 \times 8/9 \times \dots \times 2/3 \times 1/2 \times 1 = 1/10$
Indication of correct method for either fourth or last M1
P(fourth) = $1/10$ A1
P(last) = $1/10$ A1
Valid conclusion from their probabilities B1ft
- (c) Any appreciation of the fact that the two operations must involve discs of the same colour B1
P(green discs moved) = $7/10 \times 6/15 = 7/25$
P(white discs moved) = $3/10 \times 10/15 = 1/5$
Correct method for either, including seeing 15 (or 14) as the second denominator M1
P(G) = $7/25$ A1
P(W) = $1/5$ A1
Attempt to sum their probabilities for the two sequences M1
 $7/25 + 1/5 = 12/25 (= 0.48)$ A1
- [16]**
- 9 (i) Any comment which states or implies that the standard gauge is the independent variable. B1
- (ii) Correctly plotted points (-1 each error or omission) B3
- (iii) Because A, C, D and E have the four lowest x-values (or equivalent) B1
- (iv) Method for calculating overall mean M1
Plot of (21, 26) A1
Method for calculating either semi-average M1
Plot of (9.25, 14.25) A1
Plot of (32.75, 37.75) A1
- (v) Straight line through at least two of their points plotted in (iv) B1

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- (vi) $m = \text{AWRT } 1.0$
 $c = \text{AWRT } 5.0$
 $y = x + 5$ (for substituting their stated values of m and c in an equation of the required form) B1ft
- (vii) The equation shows that the new gauge will give a reading 5MPa greater than the accurate reading given by the standard gauge.
 For any correct comment about their equation in context M1
 The new gauge calibration therefore needs to be adjusted 5 MPa downwards.
 For correct description of required change to calibration cao A1

[16]

- 10 (i) (a) Any appreciation of area being proportional to frequency M1
 Correct heights 6, 20.5, 3 (provided working seen can score even if not drawn) A3
 (one mark each) B1
 Correct heights 32, 37, 21 (must be drawn) B1
- (b) Allow either 60 – under 70 (tallest rectangle) or 80 – under 100 (highest frequency) B1
- (c) Attempt to sum 41 and 15 and divide by 7 M1
 8 A1
- (ii) (a) Use of correct class mid-points, seen or implied B1
 Sight of a correct method for the mean M1
 Mean = 49.8 (cao and must be 3sf) A1
 Sight of any correct method for s.d. or variance M1
 Standard deviation = AWRT 21.3 or Variance = AWRT 453.6 A1
 21.3 (cao and must be 3sf) A1
- (b) Any use of the values 90 and 42 M1
 A convincing explanation (can imply M1 even if 90 and 42 not mentioned) A1

[16]

- 11 (a) (i) Attempt to sum values and subtract from 125 M1
 $x = 15$ A1
- (ii) x represents the number who chose to play netball and tennis, but not hockey. B1
- (iii) Showing all working necessary for a valid comparison to be made. M1
 Netball WWW A1
- (iv) 6 and 11 seen in correct places. B1
 17 and 39 seen in correct places. B1
 34 and 3 seen in correct places. B1
- (b) (i) $521 / \text{'their total'} \times 360$ M1
- (ii) Any appreciation of the need to use r^2 or $\sqrt{1.26}$ M1
 $r^2 = 25 \times (126/100)$ or $25 \times (2772/2200)$ A1
 $r = \text{AWRT } 5.6 \text{ cm}$ A1

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- (iii) Attempt to obtain total sales for 2008 (may be seen as part of (ii))
Attempt to multiply 2008 total sales by $(360 - \text{sum of angles})/360$
 $2772 \times (100/360) = 770$

M
A1