

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2015 series

4040 STATISTICS

4040/12

Paper 1, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4040	12

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘dep’ is used to indicate that a particular M or B mark is dependent on an earlier, asterisked, mark in the scheme.

The symbol  implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only.

Abbreviations

AG	answer given on question paper
awrt	answer which rounds to
cao	correct answer only
dep	dependent
ft	follow through after error
oe	or equivalent
SC	special case
soi	seen or implied
www	without wrong working

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4040	12

- 1 (i) systematic B1
- (ii) quota B1
- (iii) stratified B1
- 2 (i) mean or mode B1
- (ii) median B1
- (iii) standard deviation OR variance OR range B1
- (iv) interquartile range B1
correct method for Q1 and Q3 (cf = 8, Q1 = 2; cf = 24, Q3 = 5) M1
3 A1
- 3 (i) one two-way table M1
with rows/columns headed M, F and columns/rows headed T, C, X A1
cell values 2, 5, 1 3, 7, 2 in correct places, totals not required A2
allow A1 for four or five correct
- (ii) from these data, for males no, for females yes B1
but sample too small for general conclusion B1
- 4 (i) (a) B B1
- (b) C B1
- (c) C B1
- (ii) $12 \times$ mean for any shop M1
sum of three such products (41.04, 56.04, 45) M1
142 A1
- 5 (i) any four from 1, 5, 7, 11, 13, 14, 16, 17 for first four numbers written down
allow B1 for three correct B2
- (ii) for 4, 4, 4 $(1/6) \times (1/6) \times (1/6) (=1/216)$ B1
for 6, 6, not6 $(1/6) \times (1/6) \times (5/6)$ B1
 $\times 3 (= 15/216)$ B1
addition of all cases for 4, 4, 4 and 6, 6, not6 M1
 $16/216$ **oe** (2/27, 0.0741) A1

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4040	12

- 6 (i) cumulative frequency polygon B1
- (ii) 2.8 (hours) B1
- (iii) attempt to read length of stay corresponding to cf = 102 M1
6.5 – 6.6 (hours) A1
- (iv) correct method for numbers in paying categories (88 – 48 or 112–88 or 120–112, 40 or 24 or 8) M1
- correct payment in a paying category
 $(88-48) \times 6$ or $(112-88) \times 9$ or $(120-112) \times 12$
 $(40 \times 6$ or 24×9 or $8 \times 12)$
 and total of numbers in two adjacent categories is 64 or 32 A1
- correct method for total payment (*at least one correct product*)
 $(240 + 216 + 96)$ M1
- \$552 A1
- 7 (i) correct method for overall mean M1
 overall mean (12.5, 60.3) A1
 correct method for LSA or USA M1
 LSA (5, 77.7) A1
 USA (20, 43) A1
- (ii) correct method for gradient M1
 correct method for c M1
 $m = -2.306$ to -2.320 and $c = 89.1$ to 89.4 A1
- (iii) use of $x = 30$ in their equation M1
 20°C A1✓
ft only if gradient negative and answer is less than 38°
- (iv) correctly plotted points B2
allow B1 for five correct
- (v) straight line with negative gradient, for $t = 0$ to $t = 30$ M1
 correct line joining (0, 89) and (30, 20)
 OR line joining (0, *their c*) and (30, *their 20*) A1✓
- (vi) relationship between the variables is not linear B1
- (vii) will be higher than that calculated B1

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4040	12

- 8 (i) 748 B1
- (ii) $(525/1614) \times 100$ **AG** B1
- (iii) $((53 + 60 + 51 + 39)/1614) \times 100$ M1
awrt 12.6(%) A1
- (iv) indication of area being proportional to class frequency M1
- rectangles
width 2 height 33 A1
width 3 height 24 A1
width 5 height 12 A1
- (v) $(90/360) \times 144$ M1
36 A1
- (vi) finds $(80/360) \times 144 (= 32)$ M1*
(their 32/525) $\times 100$ M1dep
awrt 6.10(%) or **awrt** 6.1(%) A1
- (vii) finds $(70/360) \times 144 \times 0.5 (= 14)$ M1*
(their 14/their 203) $\times 100$ M1dep
6.90(%) or 6.9(%) A1
- 9 (i) (a) 11 B1
- (b) 6 B1
- (c) 4 B1
- (d) 2 B1
- (e) 8/30 **oe** B1
- (f) 6/14 **oe** B1
- (ii) (a) 4 B1
- (b) 9 B1
- (c) 16 B1
- (d) 0 B1
- (iii) for the swimmer 17/30 B1
for the track athlete 8/20 B1
multiplication of their swimmer and track athlete probabilities not multiplied by 2 M1
(provided at least one B1 earned)
17/75 **oe** A1
- (iv) any Venn diagram with a triple intersection of 1 and double intersections of 5, 2, 0 M1
fully correct and annotated diagram A1

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4040	12

- 10 (i)** 6 – under 9 B1
- (ii)** attempted use of class mid-points (1.5 4.5 7.5 10.5 13.5 17.5) M1*
 correct method for mean ($\Sigma fx = 386$) M1dep
 7.72 A1
 finding values of $f \times$ variable squared M1
 correct method for SD or variance ($\Sigma fx^2 = 3798.5$, $\Sigma fx^2 / \Sigma f = 75.97$) M1dep
 4.04 to 4.05 A1
 4.05 A1
- (iii)** km^2 B1
- (iv)** 12 B1
 20 B1
- (v)** $(1) \times (1/5) \times p \times q$ M1
 $(1) \times (1/5) \times (1/4) \times (1/3)$ A1
 $1/60$ **oe** (0.0167) A1
- (vi)** $(1 - \text{their } 1/60) \times \text{their } 1/60$ M1
 $59/3600$ **oe** (0.0164) A1✓
- 11 (i)** $6 + 35 + 680 + 961$ (= 1682) M1
 $4000 + 5600 + 8500 + 6200$ (= 24300) M1
 $(\text{their } 1682 / \text{their } 24300) \times 1000$ M1
 69.22 A1
- (ii)** correct method for any medical condition M1
 1.5 6.25 80 155 A1
- (iii)** any one medical condition rate multiplied by standard population figure M1
 sum of four such products M1
 $(1.5 \times 0.15) + (6.25 \times 0.25) + (80 \times 0.40) + (155 \times 0.20)$ **oe** A1✓
 64.79 or 64.7875 A1
- (iv)** $(1.4 \times 0.15) + (6.25 \times 0.25) + (85 \times 0.40) + (162 \times 0.20)$ **oe** M1
 68.17 or 68.1725 A1
- (v)** correct method for deaths at Southshore
 $(1.4 \times 5) + (6.25 \times 6.4) + (85 \times 7.8) + (162 \times 5.5)$ (=1601) M1
 81 (ft only on their 1682) A1✓
- (vi)** because it has the higher standardised mortality rate
 OR because mortality rates are higher for groups most at risk M1
 Southshore A1✓