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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

CAMBRIDGE
International Examinations

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

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 × 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
× 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

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) × 6 or (112–88) × 9 or (120–112) × 12 (40 × 6 or 24 × 9 or 8 × 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 *ft only if gradient negative and answer is less than 38°*	A1✓
	(iv)	correctly plotted points *allow B1 for five correct*	B2
	(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

8	**(i)**	748	B1
	(ii)	(525/1614) × 100 **AG**	B1
	(iii)	((53 + 60 + 51 + 39)/1614) × 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) × 144	M1
		36	A1
	(vi)	finds (80/360) × 144 (= 32)	M1*
		(*their* 32/525) × 100	M1dep
		awrt 6.10(%) or **awrt** 6.1(%)	A1
	(vii)	finds (70/360) × 144 × 0.5 (= 14)	M1*
		(*their* 14/*their* 203) × 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 *(provided at least one B1 earned)*	M1
		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

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 – *their* 1/60) × *their* 1/60	M1
		59/3600 **oe** (0.0164)	A1√
11	**(i)**	6 + 35 + 680 + 961 (= 1682)	M1
		4000 + 5600 + 8500 + 6200 (= 24300)	M1
		(*their* 1682/*their* 24300) × 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√