

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.

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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 \checkmark 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

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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
	<i>allow A1 for four or five correct</i>	
	(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

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

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

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