Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

STATISTICS **4040/12**

Paper 1 **October/November 2016**

MARK SCHEME

Maximum Mark: 100

Published

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.

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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 √ 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)**	carbohydrates 198° proteins 54° fats 108° (allow B1 for one correct)	B2
	(ii)	chart of radius 4 cm (±1 mm) with three sectors labelled	B1
		their sector angles correct (±2°) with correct labels	B1√
			[4]
2	**(i)**	0, 3 in correct place	B1
	(ii)	8, 12 in correct place	B1
		35 in correct place	B1√
	(iii)	40 in correct place	B1
		10, 29 or 10, 6 in correct place	B1√
		fully correct table	B1
			[6]
3	**(i)**	correct method for mean *of d values* (d = 12, 4, –4, –7, –1, 0, 10 $\Sigma d = 14$)	M1
		mean = 1002	A1
		correct method for SD or variance *of d values* ($\Sigma d^2 = 326$)	M1
		SD = 6.52 or 6.52 …	A1
	(ii)	mean = their 1002 – 80 (= 922)	B1√
		range = 19	B1
			[6]
4	**(i)**	17	B1
	(ii)	19	B1
	(iii)	correct method (e.g. 11 + 7 + 8 + 5 + 1 + 3)	M1
		35	A1
	(iv)	9	B1
	(v)	11	B1
			[6]

5 **(i)** 3/87 or 1/29 B1

(ii) 64/87 B1

(iii) 69/84 or 23/28 B1

(iv) (84/87) × (3/86) M1

× 2 M1

504/7482 or 252/3741 or 84/1247 A1

[6]

6 **(i)** indication of appropriate method
by finding total of passengers boarding or alighting
(e.g. 27 + 4 + 14 + 7 + 2) M1

54 A1

(ii) indication of appropriate method
by finding numbers travelling between stops
(27, 27, 30, 25, 34, 34, 37, 39, 30)
implied by one correct answer M1

25 A1

39 A1

(iii) **(a)** comfort B1

(b) cost B1

(c) punctuality B1

[8]

7 **(i)** 48 + 68 + 20 + 11 (=147) M1

48 + 80 + 32 + 20 (=180) M1

correct expression seen leading to given answer
(147/180) × 100 A1

81.7% AG

(ii) correct method for very good, good or moderate group M1

100 85 62.5 55 A1

(iii) any one of very good, good or moderate group rate multiplied by standard population figure — M1

sum of four such products — M1

$(100 \times 0.20) + (85 \times 0.35) + (62.5 \times 0.30) + (55 \times 0.15)$ — A1√

76.75% or 76.8% — A1

(iv) $(45 \times 1) + (78 \times 0.833) + (44 \times 0.659) + (33 \times 0.606)$ (=159) — M1

((their 159)/(45 + 78 + 44 + 33)) × 100 (=159/2) — M1

79.5% — A1

(v) $(100 \times 0.20) + (83.3 \times 0.35) + (65.9 \times 0.30) + (60.6 \times 0.15)$ — M1

78.0% — A1

(vi) higher standardised pass rate/ achieves greater success with less able students — M1

Hale — A1√

[16]

8 (i) attempted use of class mid-points (17, 19, 21, 23, 26) — M1*

correct method for mean (Σfx = 1277) — M1dep

21 or 21.2 or 21.3 or 21.28 ... — A1

finding values of $f \times$ variable squared (e.g. 1445, 5054 ...) — M1

correct method for SD or variance (Σfx^2 = 27545) — M1dep

2.5 or 2.47 – 2.50 — A1

21.3 and 2.47 — A1

(ii) 8, 17 in correct place — B1

any indication of column area being proportional to frequency implied by any one correct answer for three non-standard width classes — M1

4, 21, 10 — A3

(iii) their4 × 26 + their8 × 29 + their17 × 31 + their21 × 33.5 + their10 × 37.5 (=1941.5) M1

their 1277 + their 1941.5 (=3218.5) M1

their 3218.5/60 with $\Sigma f = 60$ from (ii) M1

54
ft only on their 1277 A1√

[16]

9 (i) 4, 15, 35, 60, 74, 80 B1

(ii) horizontal plots at UCBs B1

their vertical plots at cfs M1

suitable curve A1

(iii) **(a)** 355 – 362.5 (litres) B1

(b) Q1 find consumption for cf = 20 (312 – 317 (litres)) M1

Q3 find consumption for cf = 60 (400 (litres)) M1

use of IQR = Q3 – Q1
with at least one of Q1, Q3 found properly from their curve M1

83 – 88 (litres) A1

(c) attempt to find cf at 375 litres (48) as a percentage of 80 M1

58.75 – 61.25 A1

(iv) 1 – (their (iii)(c))/100) B1√

(v) their median × 80 (360 × 80 = 28800) M1

their 28800/1000 (=28.8) M1

(their 28.8 × \$2.50) + (80 × \$0.25) M1

\$92 A1√

[16]

10 (i) 15 000 B1

(ii) 15 × 2500 – 5 × 2500 M1

25 000 A1

(iii) $[(15 \times 2500 - 13 \times 2500)/(13 \times 2500)] \times 100$ oe M1

15% or 15.4% or 15.38 ...% A1

(iv) **(a)** 3/6 B1

(b) 3/6 B1

(c) 3/5 B1

(v) find decrease
for total 15000 – 12500 (=2500) or
for Com $0.3 \times (15000 - 12500)$ (=4500 – 3750 = 750) or
for others $0.7 \times (15000 - 12500)$ (=10500 – 8750 = 1750) M1

find appropriate fraction
2500×0.14 or $(2500 - 750) \times 0.2$ or 1750×0.2 M1

350 A1

(vi) $0.3 (\times 1) + 0.7 \times (4/5)$ M1

0.86 A1

(vii) $(0.3)^3 (\times 1)$ B1

$+ (0.14)^3 \times 2$ M1

0.032 or 0.0325 or 0.0324 ... A1

[16]

11 (i) correctly plotted points
(allow B1 for 6 or 7 correct) B2

(ii) correct method for USA M1

(6.5, 62) plotted correctly A1

(4.5, 79) and (2.5, 96) plotted correctly B1

(iii) line through at least two of their plotted averages B1

correct method for gradient M1

correct method for c M1

m = –8.60 to –8.40 and c = 116 to 118 A1

(iv) setting y = 0 in their equation, solving for x (and subtracting 8) M1

6 (accept decimal answer 5.8) A1

(v) (substantial) extrapolation beyond range of data/
relationship established may change/
relationship may become non linear
(do not accept references to relapsing alone) B1

(vi) **(a)** any indication that c only is determining factor M1

George: highest c, highest y at the start where x=0
ft conclusion from their equation for Alfred A1√

(b) any indication that m only is determining factor M1

Joseph: *magnitude* of m is largest, steepest negative gradient
ft conclusion from their equation for Alfred A1√

[16]