CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2015 series

4040 STATISTICS

4040/22 Paper 2, 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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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)** **awrt** 16.7 B1
awrt 3.7 B1

(ii) Hotter in 2010 **oe** B1
Less varied in 2010 **oe** B1

2 **(a)** Insufficient information to decide
Insufficient information to decide
Definitely not mutually exclusive All 3 correct B2
B1 for two correct

(b) **(i)** Use of P($C \cap D$) = P(C) × P(D) M1
$0.4 \times 0.3 = 0.12$ A1

(ii) Use of P($C \cup D$) = P(C) + P(D) – P($C \cap D$) M1
$0.4 + 0.3 - 0.12 = 0.58$ A1

3 **(i)** $(151.9 - 148.5)/148.5 \times 100$ OR $(151.9/148.5 \times 100 - 100)$ OR $3.4/148.5 \times 100$ B1

(ii) 4.3[28…] B1
[–] 1.5[21…] B1

(iii) Attempt at change chart illustrating positive and negative change B1*
Suitable scale, labelled as percentage change and all bars labelled B1dep
Correct bars (within ± ½ small square) B1dep

4 **(i)** **(a)** $(x - 50)/10 = (48 - 58.1)/8.1$ OR $x = 50 + 10/8.1(48 - 58.1)$ M1
awrt 37.5 A1

(b) $(x - 50)/10 = (x - 58.1)/8.1$ M1
awrt 92.6 or 93 A1

(ii) $(30 \times 58.1 - 23 \times 56)/7$
One correct product seen, 30×58.1 OR 23×56 [1743 OR 1288] M1*
$(30 \times 58.1 - 23 \times 56)$ [455] M1dep
/7 = 65 A1

5 **(i)** Attempt at reading from graph – 27 or attempt at reading from graph + 41 M1
588 – 589 A1
650 – 651 A1

(ii) [Original data] below the trend line [on average]/on average $38 below trend line B1

(iii) [Daily/quarterly] sales reducing *(but not each quarter)* **oe** B1

(iv) 24 B1

6 **(i)** 135 *(allow 135.75 or 136)* B1

139.5 + ('135' – 104)/43 × 10 or 149.5 – (147 – '135')/43 × 10 **oe** M1 M1

awrt 146.7 A1

SC *B1 for 123.0*

(ii) (116 – 109.5)/20 × 31 M1

Some fraction of 31 + 24 M1

34 **www** A1

7 **(a)** **(i)** Advantage: quicker, cheaper, easier to handle (**oe**) B1

Disadvantage: less accurate, may not be representative (**oe**) B1

(ii) 100, 200, 300, 400, 500, 600

Any systematic sample B1

Starting value 100 B1

Gaps of 100 and 6 values in range B1

(iii) One that gives each member of the population an equal chance of being selected B1

(b) **(i)** Attempt at job type totals [20, 30, 10] *(can be implied)* M1

Evidence of 2, 3, 1 of each *(only implied by a fully correct answer)* A1

24(T), 19(C), 50(E), 43(T), 38(T), 13(C) B3

–1 each independent error

(ii) M, F, M, F, M, F, so 3 of each *(identifying the genders in their sample)* B1✓

Should have 4 males and 2 females/twice as many males as females B1*

So not representative B1✓dep

(iii) Because it is likely to be most relevant to enjoyment *(or any related reason)* B1*

Sample stratified by job type more appropriate B1dep

(gender could score here if reason clearly connected to enjoyment of work)

8	**(a)**	**(i)**	Non numerical	B1*
			so qualitative	B1dep
		(ii)	22% represents 33 students *(can be implied)*	B1
			Using 33/"22"	M1
			Correct method for any one subject *(can be implied)*	M1
			Plumbing = 54, Carpentry = 129, Building = 117 *(A1 for 2 correct)*	A2
		(iii) **(a)**	Plumbing = 46%, Carpentry = 80% /greater percentage studying Carpentry	M1
			so definitely false	A1
		(b)	Numbers of students in 2013 not known	B1*
			so insufficient information to decide	B1dep
	(b)	**(i)**	Can take any value [in a range] OR can be measured	B1*
			so continuous	B1dep
		(ii)	23 AND 26	B1
			3	B1
		(iii)	Speedy Wheelers cycled further **oe**	B1
9	**(i)**	**(a)**	8/18 or 4/9 or 0.44	B1
		(b)	4/18 or 2/9 or 0.22	B1
		(c)	3/8 or 0.375 or 0.38	B1
	(ii)		$7/18 \times 11/17 \times 2$	
			7×11 seen in numerator (**oe** $4 \times 5 + 3 \times 6 + 3 \times 5 + 4 \times 6$)	B1*
			Product of 2 probabilities $\times$ 2 **oe**	M1dep
			$n \times n - 1$ in denominator	M1
			77/153 o. e. 0.50[3…]	A1
	(iii)		$15/18 \times 14/17 \times 13/16 \times 3/15$	
			"18" – 3 seen in numerator	M1
			$n \times (n - 1) \times (n - 2) \times (n - 3)$ in denominator	M1
			91/816 **oe**	A1
	(iv)		$(4/10 \times 6/9 \times 5/8 \times 4/7) \times 2 + (6/10 \times 5/9 \times 3/8 \times 5/7) \times 2$	
			10 and 8 seen multiplied in a denominator	M1*
			One ( ) correct	M1dep
			At least 2 products of 4 probabilities with $4 \times 6 \times 5 \times 4$ in one numerator and $6 \times 5 \times 3 \times 5$ in the other	M1
			31/84 **oe**	A1
	(v)		$1/3 \times 6$ or $2/5 \times 5$ seen	M1
			4/11 (or 0.36..)	A1

10 (i) 8.52/7.96 [× 100] OR (8.52 – 7.96)/7.96 × 100 OR 7.96 × 107 / 100 = M1
Fully correct method, 8.52/7.96 × 100 = 107 OR (8.52 – 7.96)/7.96 × 100 + 100 **AG** A1

(ii) 7.96 × 103 / [100] = [8.1988] **oe** M1
8.20 A1

(iii) Price/cost fell by 3% B1
Between 2011/base year and 2012 B1

(iv) Any one correct method *(can be implied)* M1
awrt 106, 96, 97, 107 A2
A1 for any 2 or 3 correct

(v) (106 × 12 + 96 × 9 + 97 × 4 + 107 × 2)/(12 + 9 + 4 + 2)
Σ any price rels × weight M1
Σ *their* **(iv)** × weights / Σ*w* (27) M1
101.4–101.7 **www** A1√

(vi) 319 000 × *their* **(v)** /100 M1
323 000 A1√

(vii) As price changes [in A OR D] have been accounted for in the price relatives B1*
A AND D B1dep

11 (i) 0.05 B1

(ii) 0.4 × 1 + 0.2 × 2 + 0.2 × 3 + 0.15 × 4 + '0.05' × 5 [= 2.25] M1
"2.25" – 2.40 M1
Loss of 0.15 *(must state 'loss' somewhere or –0.15)* A1

(iii) **(a)** P(3 or less) = 0.4 × 0.4 + 0.4 × 0.2 × 2 *(condone × 2 missing)* M1
= 0.32 A1

(b) "0.32" × *y* = 2.40
y = 7.50

(c) "0.32" × 100 = 32 B1√
("7.50" – 9) × "32" **or** 2.40 × 100 – "32" × 9 (±), M1
Loss of $48 A1

(iv) P(1) = 150/360 = 5/12 **oe**
P(2) = 120/360 = 1/3 **oe**
P(3) = 90/360 = 1/4 **oe** All 3 correct B2

"5/12" × *x* + "1/3" × 2*x* + "1/4" × 3*x* = 11 M1
x = 6 A1
Prizes = 6, 12, 18 A1