

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.

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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

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1	(i) awrt 16.7 awrt 3.7		B1 B1
	(ii) Hotter in 2010 oe Less varied in 2010 oe		B1 B1
2	(a) Insufficient information to decide Insufficient information to decide Definitely not mutually exclusive <i>B1 for two correct</i>	All 3 correct	B2
	(b) (i) Use of $P(C \cap D) = P(C) \times P(D)$ $0.4 \times 0.3 = 0.12$		M1 A1
	(ii) Use of $P(C \cup D) = P(C) + P(D) - P(C \cap D)$ $0.4 + 0.3 - 0.12 = 0.58$		M1 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...] [-] 1.5[21...]		B1 B1
	(iii) Attempt at change chart illustrating positive and negative change Suitable scale, labelled as percentage change and all bars labelled Correct bars (within $\pm \frac{1}{2}$ small square)		B1* B1dep B1dep
4	(i) (a) $(x - 50)/10 = (48 - 58.1)/8.1$ OR $x = 50 + 10/8.1(48 - 58.1)$ awrt 37.5		M1 A1
	(b) $(x - 50)/10 = (x - 58.1)/8.1$ awrt 92.6 or 93		M1 A1
	(ii) $(30 \times 58.1 - 23 \times 56)/7$ One correct product seen, 30×58.1 OR 23×56 [1743 OR 1288] $(30 \times 58.1 - 23 \times 56)$ [455] $/7 = 65$		M1* M1dep A1
5	(i) Attempt at reading from graph – 27 or attempt at reading from graph + 41 588 – 589 650 – 651		M1 A1 A1
	(ii) [Original data] below the trend line [on average]/on average \$38 below trend line		B1
	(iii) [Daily/quarterly] sales reducing (<i>but not each quarter</i>) oe		B1
	(iv) 24		B1

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- 6 (i) 135 (allow 135.75 or 136) B1
 139.5 + or 149.5 – M1
 ('135' – 104)/43 × 10 (147 – '135')/43 × 10 oe 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)

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- 8 (a) (i) Non numerical
so qualitative B1*
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 A2
(A1 for 2 correct)
- (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 × 5 + 3 × 6 + 3 × 5 + 4 × 6) B1*
Product of 2 probabilities × 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 × 6 × 5 × 4 in one numerator
and 6 × 5 × 3 × 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

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- 10 (i)** $8.52/7.96 [\times 100]$ OR $(8.52 - 7.96)/7.96 \times 100$ OR $7.96 \times 107 / 100 =$ M1
Fully correct method, $8.52/7.96 \times 100 = 107$ OR $(8.52 - 7.96)/7.96 \times 100 + 100$ **AG** A1
- (ii)** $7.96 \times 103 / [100] = [8.1988]$ **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)** $(106 \times 12 + 96 \times 9 + 97 \times 4 + 107 \times 2)/(12 + 9 + 4 + 2)$
 Σ any price rels $\times$ weight M1
 Σ *their* **(iv)** $\times$ weights / Σw (27) M1
101.4–101.7 **www** A1✓
- (vi)** $319\,000 \times \text{their (v)} / 100$ 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)** $0.4 \times 1 + 0.2 \times 2 + 0.2 \times 3 + 0.15 \times 4 + '0.05' \times 5 [= 2.25]$ M1
"2.25" – 2.40 M1
Loss of 0.15 (*must state 'loss' somewhere or –0.15*) A1
- (iii) (a)** $P(3 \text{ or less}) = 0.4 \times 0.4 + 0.4 \times 0.2 \times 2$ (*condone $\times 2$ missing*) M1
= 0.32 A1
- (b)** "0.32" $\times y = 2.40$
 $y = 7.50$
- (c)** "0.32" $\times 100 = 32$ B1✓
("7.50" – 9) $\times$ "32" **or** $2.40 \times 100 - "32" \times 9 (\pm)$, 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" $\times x + "1/3" \times 2x + "1/4" \times 3x = 11$ M1
 $x = 6$ A1
Prizes = 6, 12, 18 A1